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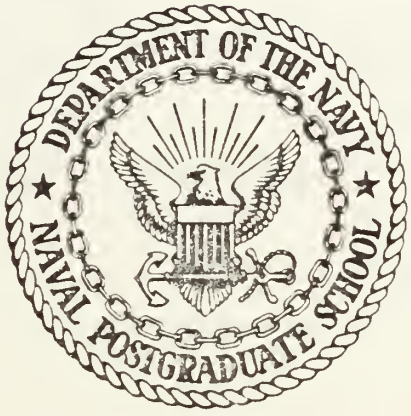

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A STUDY OF THE
COMMUNICATIONS SERVICES INDUSTRIAL FUND

by

Jan Michele Hinton

March 1985

Thesis Advisor: Jack LaPatra

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The basic conclusion reached as a result of the study is that there are areas of the fund requiring change if the CSIF is to accomplish its purpose. The incentives derived from existing methodology undermine the benefits which were envisioned when industrial funding was extended to communications.

A Study Of The Communications Services Industrial Fund

by

Jan M. Hinton
Lieutenant, United States Navy
B.S., University Of Illinois, 1976

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requirements for the degree of

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ABSTRACT

The Communications Services Industrial Fund (CSIF) is an integral tool available to the Defense Communications Agency in directing and controlling the operations of the Defense Communications System. This thesis is an analysis of how effective the current structure of the fund has been in allowing the Defense Communications Agency to meet its objectives. A detailed description of the history, purpose and procedures of the fund is provided in the first three chapters. Subsequent chapters examine the fund in the context of management and efficiency difficulties arising from present practices. Alternatives to the current structure are outlined and analyzed.

The basic conclusion reached as a result of the study is that there are areas of the fund requiring change if the CSIF is to accomplish its purpose. The incentives derived from existing methodology undermine the benefits which were envisioned when industrial funding was extended to communications.

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I. INTRODUCTION

A. PURPOSE

Today's telecommunications managers are required to have an overall systems understanding in order to direct processes effectively. Though it becomes easy to narrow one's viewpoint to those areas of immediate concern, this perspective inhibits influential management of the total operation. Representative of this problem are those Defense Communications Agency (DCA) assets comprising the Defense Communications System (DCS) which are integrated into the Naval Telecommunications System (NTS). Systems such as AUTODIN and AUTOVON, which are segmented under various organizations, need to be considered as a whole for management purposes. These systems are often viewed in pieces by managers, with little thought given to those portions not falling under their direct control. There is a lack of understanding regarding how actions on one section effects the rest or what influences the system as an aggregate.

The reasons for such a disassociation from the whole are varied. In part it is due to the segregation of responsibility and management authority. The parochialism which enters into the budgeting process adds its influence. The incentives imbedded into current rate development processes and pricing policies are also involved. This thesis will attempt to address such issues by looking at the management questions surrounding DCA leased resources. Specifically, the means of payment through the Communications Services Industrial Fund (CSIF) will be examined in the context of its influence on the management of various backbone portions of the DCS.

B. REVOLVING FUNDS

The Communications Services Industrial Fund is one of a group of Department of Defense (DOD) funds which are referred to as revolving, industrial or working-capital funds. Five industrial funds have been established within the DOD [Ref. 1: pp. H3-H4] :

Army Industrial Fund - principally depot supply, maintenance, and research activities; the Military Traffic Management and Terminal Service is the largest activity within the fund.

Navy Industrial Fund - the largest of the DOD industrial funds. The Navy Industrial Fund includes the majority of Navy's rework facilities such as shipyards, air rework and ordnance facilities, public work centers, research facilities and the Military Sealift Command.

Marine Corps Industrial Fund - the smallest of the DOD industrial funds; finances equipment, maintenance depots and technical engineering support.

Air Force Industrial Fund - includes depot maintenance of aircraft and the Military Airlift Command.

Defense Industrial Fund - consists of the Defense Clothing and Textile Center and the Communications Services Industrial Fund.

The DOD is not the only federal agency which uses the concept of the industrial fund. Almost all agencies employ them for funding of centralized administrative services such as communications, photography, automatic data processing (ADP), library and duplicating. The General Services Administration finances Federal buildings, general supplies, Federal telecommunications, and ADP through revolving funds

in addition to administrative functions. The Food and Drug Administration uses a revolving fund for the services it provides on a reimbursable basis to industry.

As can be seen, a variety of activities are funded through this device. The designation of areas which are to fall under industrial funds is left to the services or agencies involved, however approval is required from the Secretary of Defense level. Any industrial or commercial-type activities that provide common services within or among the departments and agencies of the DOD are eligible. The requirement also exists for a buyer-seller or a contractual relationship between the provider of the services and the activity receiving such services.

All industrial funds receive initial capitilization from Congress by way of a corpus. From this point the fund survives by rotating funds from the corpus to the suppliers, then billing the customers to replenish the corpus. Hence the name revolving. The objective is not profit but achieving zero surplus or loss. More specifically, the industrial fund activity receives a work request from a customer. The work is performed either by the activity itself or through contracting out. Corpus money is used to pay the bills. The fund is then reimbursed by billing the requesting activity.

The CSIF was established as a means of funding all leased communications assets for the DOD, to include private line communications services, communications equipment and facilities. It operates as do all other of the funds in general. It is managed by DCA with a corpus currently funded at $20 million. Two divisions of DCA are essentially involved: the CSIF division and the Defense Commercial Communications Office (DECCO). Both will be discussed in later chapters, however, a brief description of fund operations is included here for introductory purposes.

DECCO is responsible for leasing all required communications assets for DOD and authorized non-DOD agencies. The customer provides DECCO with a request for services. After evaluation, DECCO orders the communications from commercial companies. The company provides the services to the customer but bills DECCO. DECCO then pays the company and bills the customer. The customer paying DECCO replenishes the corpus, completing the cycle. The customer is billed at predetermined rates determined by the CSIF division.

There are numerous reasons for the introduction of industrial funding concepts into the DOD. These will be discussed in detail in later sections. Whatever the reasons, industrial funds are not a small business. In fiscal year 1975 over 100 Defense activities were operating under industrial funds, employing approximately 37,000 military personnel and 298,000 civilians (about 27% of the DOD civilian workforce). Sales were nearly $9.9 billion, ranking the industrial fund complex equal with U.S. Steel, the 14th largest industrial corporation. [Ref. 2: p.2] The DOD budget for fiscal year 1975 called for an outlay of $87.9 billion, $24 billion of which was to be spent through working capital funds [Ref. 3: p. 16]. In fiscal year 1984, civilian employees involved with industrially funded activities accounted for 29% of the DOD civilian work force and expected sales approximated $24 billion [Ref. 4: p. 1].

The CSIF funds over 15 million miles of leased circuitry, dealing with over 300 commercial companies (domestic, international and foreign). Over 80,000 contracts are administered monthly. The annual cost of leasing services for fiscal year 1985 is projected to exceed $1 billion. [Ref. 3: p.8]

C. QUESTIONS FOR THE MANAGER

From the foregoing it can be seen that the CSIF is not an inconsequential element in military communications and therefore an understanding of how it works could prove beneficial to the manager. Knowledge of the mechanics of its operations however is not sufficient for understanding its importance. Other questions that should be kept in mind throughout are listed below as an aid in looking at the CSIF from the standpoint of the system as a whole and the effect it has on the management of that system.

(1) What are the problems associated with the CSIF and what effect do those problems have on the manager and the system.

(2) What effect do the budgetary procedures have on the fund, the manager and the system.

(3) Do current practices allow for effective management of the DCS and if not what changes are needed?

(4) Do the standard rates currently used for distributing costs result in allocative efficiency [1] and if not what effect, if any, has this had on system architecture.

(5) What effect will proposed changes to the fund have on the system, and user behavior.

Many other questions could be outlined at this point, however, the underlying theme of all would be the same. What influences do various factors associated with the CSIF have on the system, the manager, and user behavior?

---

[1]Allocative efficiency is defined for the purpose of this thesis as distributing costs in such a way that the incentive structure created induces users to behave as desired. In terms of the DCS, DCA is concerned with using pricing policies of the CSIF to influence customers in a manner beneficial to system characteristics such as capacity, congestion and optimum mix of lines.

D. SCOPE

This thesis will address those questions raised in Section C as well as provide an in-depth look at how the fund works. A brief preview of each chapter is provided below:

Chapter II - outlines the history of the CSIF including why it was established and what it was hoped it would accomplish. A description of the two main DCA divisions involved, CSIF division and DECCO, is included as well as an analysis of the mechanics of the fund, assets covered, customers serviced and suppliers used.

Chapter III - provides an in-depth review of budgetary and rate development procedures.

Chapter IV - analyzes the efficiency of the fund and delves into how the fund has influenced user behavior and system architecture to date. A number of issues effecting proper management of the DCS are also discussed.

Chapter V - discusses proposed changes to the fund. The perceived need for such changes is examined and the hoped for consequences are discussed.

Chapter VI - provides conclusions and recommendations to issues discussed throughout the thesis.

II. HISTORY AND DESCRIPTION OF THE CSIF

A. INITIAL ESTABLISHMENT OF INDUSTRIAL FUNDS

The oldest existing working-capital fund is the Navy Stock Fund. Prior to 1878, all supply inventories were maintained and distributed on a free issue basis. In that year an annually appropropriated revolving fund was created as an attempt at better management by requiring customers to budget for needed supplies. Five years later the Navy Supply Fund Act was passed with the following description [Ref. 1: p. G3] :

> "And the Secretary of the Treasury is hereby authorized and directed to cause the general account to be charged with the sum of two hundred thousand dollars, which amount shall be carried to the credit of a permanent naval supply fund to be used under the direction of the Secretary of the Navy in the purchase of ordinary commercial supplies for the naval service, and to be reimbursed from the proper naval appropriations whenever the supplies purchased under said fund are issued for use."

With this, the basic attributes of industrial funds were initiated. A corpus was to be set from which payments were made to suppliers and reimbursements made by customers, from money budgeted and appropriated for that purpose.

No other use was made of this concept until 1949 when the Defense Industrial Funds were established through amendment of the National Security Act of 1947. The Act itself created the Department of Defense. Provisions of Title 10, United States Code, Section 2208 authorized the Secretary of Defense to require establishment of working capital funds in the DOD to provide working capital for such industrial-type and commercial-type activities as provide common services

within or among the Departments and Agencies of the DOD, as the Secretary may designate. [Ref. 5: p. 1-1]

Prior to 1949 almost all projects or budget programs were financed from numerous appropriations. Appropriations were managed by widely disbursed and unrelated organizational divisions having varying degrees of operational responsibility. Some activities received money from as many as 200 or more separate allotments. The Comptroller General reported that at one point over 10,000 allotments or administrative subdivisions had been established at one installation. [Ref. 2: p. 13]. Goods produced and services rendered were provided free to Defense customers.

The result of this was that little attention was paid to cost by the managers and users felt few financial constraints for placing orders. Accounting systems were concerned with keeping track of obligations and disbursements for each appropriation or allotment and insuring that individual funding limits for each expense category were not exceeded. Cost accounting systems were limited, making it difficult to relate costs to end products or projects. The Comptroller General reported that [Ref. 2: p. 13] :

> "...it becomes increasingly more obvious that the excessive use of detailed administrative allotments as the basis for administering programs under appropriated funds is a significant factor in the confused and unsatisfactory situation with respect to financial control in the Department of Defense."

In a similar vein, Herbert Hoover, as Chairman of the Hoover Commission on Organization of the Executive Branch of the Government, testified before the Senate Armed Services Committee in April 1949 that [Ref. 2: p. 14] :

> "The budgetary and appropriation structures in the Army and Navy are antiquated. They respresent an accumulation of categories arrived at on an empirical and historical basis. They do not permit ready comparisons, they impede administration, and interfere with the efficiency of the military establishments."

The cure for these problems was seen in consolidating industrial and commercial-type activities of a similar nature under the industrial fund concept, in order to bring commercial business practices into the military setting without the duplication of efforts that would result if accounting procedures were simply overhauled at each individual activity. Accounting practices were also not the only area of concern, but were coupled with the desire to promote more efficient operations. Industrial funds were intended to incorporate three important features to encourage better management and create an environment similar to that of private industry [Ref. 2: p. 10] :

(1) Businesslike cost accounting would be used which would focus attention on the cost of getting the job done, simplify budgeting, and provide cost information for management control.
(2) A revolving fund, relatively free from the appropriation cycle with its established spending limitations, would give management the financial authority and flexibility to adjust operations for changes in workload and achieve efficiencies and cut cost.
(3) A buyer-seller relationship would be established between customers and producers, forcing customers to pay for what they receive and making producers financially dependent on obtaining orders from customers and matching costs with reimbursements to remain solvent.

Reference 5 lists the following objectives industrial funds were designed to meet [Ref. 5: pp. 1-1,1-2] :

a. Provide a more effective means for controlling the costs of goods and services required to be produced or funished by industrial- and commercial-type

activities, and a more effective and flexible means for financing, budgeting, and accounting for the costs thereof.

b. Create and recognize contractual relationships between industrial- and commercial-type activities and those activities that budget for and order the end-products or services, in order to provide management advantages and incentives for efficiency.

c. Provide to managers of industrial- and commercial-type activities the financial authority and flexibility required to procure and use manpower, material, and other resources effectively.

d. Encourage more cross-servicing among the DOD Components and among their operating agencies, with the aim of obtaining more economical use of facilities.

e. Facilitate budgeting for and reporting of the costs of end-products. This will underline the cost consequences of choosing between alternatives.

f. To furnish managers of industrial- and commercial-type activities with modern management tools comparable to those utilized by efficient private enterprises engaged in similar types of activities.

g. To improve cost estimating and cost control by using the constraints of a formal contractual relationship and the requiremnt for the comparison of estimates and actual costs.

h. To obtain alert, forward-looking financial planning at industrial-and commercial-type activities by making them financially dependent on reimbursements received

for goods and services furnished in fulfilling orders from customers.

i. To encourage producers of goods and services to coordinate labor forces and inventories with workload, budgeting, and cost control.

j. To instill in the officials of ordering agencies a greater sense of responsibility and self-restraint in limiting their orders and in balancing the cost of specific goods and services to be ordered against the benefits and advantages of their procurement, especially in the light of alternative or competing demands.

k. To place ordering agencies in the position of critic of purchase prices, as well as quality and delivery-speed of the goods and services ordered.

l. To enable ordering agencies to budget and account on an "end-product" basis (the same as when buying from commercial contractors), simplifying budget presentations, budgetary control, and accounting procedures for both producers and ordering agencies.

m. To establish, whenever feasible, stabilized rates and unit prices for goods and services furnished by industrial fund activities, thus enabling ordering agencies to plan and budget more confidently.

n. To encourage ordering agencies' management to improve program planning and sceduling in response to producers' efforts to plan and negotiate for orders as far in advance as feasible.

The concept of industrial funds envisioned by Congress and their intent in authorizing them can be summarized by

the following excerpts from Senate Report No. 366 (May 12, 1949, on S. 1832). [Ref. 6: pp. 13-14]

"A report of the Naval Affairs Committee of the House in 1945 pointed out the lack of adequate cost accounting in this type of activity. It stressed the necessity for developing some means for ascertaining the cost of work performed. In administrating appropriated funds, the contemporary allotment type of control direct from appropriations can be developed to a satisfactory point in administrative or strictly military type functions. However, such an administrative type of management and financial control fails utterly in contributing to the proper management of industrial and commercial type activities, and, without complete duplication of cost systems, cannot provide information as to the cost of work performed. The problem can be solved in a manner that fits into the framework of the performance type budget. An operating or working capital fund can be established for the operations of such activities, eliminating entirely the many sources of funds now used to finance their day to day operations. In effect, working capital would be available to those who actually run or administer any industrial type or commercial type activity performing common services--making those officials fully responsible for a direct accounting for the money they spend, the costing of each job, and the most economical method of accomplishing the work. All costs of the operation of this industrial type or commercial type activity would be paid from the working capital fund, using standard, accepted, and approved commercial practices for the distribution of direct and indirect costs of jobs in process. The activity which places a work order....would establish proper commitments and obligations against money appropriated to it--generally in the same manner as would be followed if this order were placed for the work to be done by a private concern. The industrial plant would enter the order and distribute the work in the plant by its own job orders--fundamentally sound procedure. When the work is completed and the cost of the job ascertained, the plant will invoice or bill the cost to the ordering military agency...."

"Accounting and reporting systems would be simplified and the cost of work performed would become chargeable directly to the budget program as it was presented and justified before the Congress. The amount of work performed in such industrial type and commercial type activities under the working capital concept would be directly controlled by orders placed within the limits of money appropriated for such work. Subsection 405(a) of Security Acts Amendments, 1949, contains language which would authorize and direct the Secretary of Defense immediately to begin this major needed improvement for the business-like operation of the military establishment."

B. THE BEGINNING OF THE CSIF

In 1949, the four services' industrial funds were initiated. Evolution of the communication systems and policies within the DOD were required, however, before the need for the CSIF was realized. Prior to 1957, there was no consolidation of effort in the area of communication services. Every agency within the DOD was responsible for leasing its own assets to fulfill various needs, resulting in extensive duplication of effort and inefficient cost results due to the inability to take advantage of large scale buying.

The idea of a central organization whose purpose was to perform all leasing functions within the DOD began in 1957 with the activation of the Air Force's Air Defense Command Section to deal with all leasing and management elements of communications for the SAGE (Semi-Automatic Ground Environment) System. This first attempt at a consolidation of efforts proved successful with unit costs going down and efficiency up. The activity was expanded to become the single focal point for leased communications within the Air Force. In 1961, it was given the management of the TELPAK TARIFF by DOD and subsequently incorporated as the central control point for leased communications within DOD, with a name change to Office of Commercial Communications Management (OCCM). Two years later, on 1 January 1963, OCCM became a field activity of DCA designated as the Defense Commercial Communications Office. DECCO was designated by the Secretary of Defense as the sole leasing agent and manager of private line communications service for the DOD.

Though a centralized organizational system now existed, no such convergence was evident in the communications systems themselves. Each military department funded and maintained its own world-wide long distance communications networks. In 1963 they consisted of:

STARCOM - Strategic Army Communications System

NAVCOMSYS - Naval Communications System

AIRCOM - Air Force Communications System

These separate systems created undesirable duplications and in many cases did not include the standards of reliability, survivability and speeds required for national command authorities.

In 1963, the Secretary of Defense approved a concept to implement two world-wide automatic switched systems in order to create a common backbone network within the DCS. AUTOVON was formed in 1964 by linking together the Air Force North American Air Defense Commands Automatic Dial Switching Network and the Army's Switched Circuit Automatic Network. AUTODIN was drawn from the former Air Force DATACOM System.

With the integration of leased services underway, concern was growing over efficient funding control. On May 4 1963, the Deputy Secretary of Defense requested the Assistant Secretary of Defense (Comptroller) and the Director, DCA to conduct a study of alternative methods of programming, budgeting and funding the various elements of the DCS. The study concluded as a major point that user agencies, to the extent practicable, should pay for services received. In this way, a cost conscious control could be exercised over requirements. In addition, it was felt that elements should be incorporated so that:

(1) costs by function and area could be identified and examined on a continuous basis.

(2) planned improvements could be given a realistic cost effectiveness analysis.

(3) funding cutbacks could be examined to better evaluate the impact.

(4) the system would be compatible with established programming, budgeting and financing criteria of the military departments.

The study concluded that an industrial fund method of financing the DCS offered the greatest advantage for centralized control of financial resources. [Ref. 7: pp.8-9]

The establishment of the CSIF was approved by the Secretary of Defense in 1964. With approval of the CSIF charter in April of 1965, the fund began operations on 1 July 1965. The charter set down the following guidelines for fund operations [Ref. 8: p. 2] :

> "The Defense Communications Agency is authorized hereby to finance those Department of Defense communications services as directed by the Secretary of Defense, including the operations of the Defense Commercial Communications Office (DECCO)...."
>
> "Under the management control of the Director, Defense Communications Agency, the purpose of the "Communications Services Activity" is to furnish those communications services, as authorized by the Secretary of Defense, to Departments and Agencies of the Department of Defense. As directed or authorized by the Director,Defense Communications Agency, or higher authority, the "Communications Services Activity" will also furnish such communications services to other U.S. Government Departments and Agencies or other users as may be appropriate and authorized by law."
>
> "Predetermined subscriber rates will be the basis for recovering the cost of operating and maintaining the backbone networks (switches and trunks) and an applicable portion of the cost of operating the Defense Commercial Communications Office. All costs of access lines, dedicated or special purpose networks, and any termination charges will be reimbursed by authorized users, including an applicable share of the cost for operating the Defense Commercial Comunications Office. Subscriber rates, which will be subject to the prior approval of the Assistant Secretary of Defense (Comptroller), will be developed, revised as required, and published by the Director, Defense Communicatcns Agency."

C. THE PLAYERS

The operations of the CSIF involves extensive interplay between various components: the CSIF division which falls under the comptroller directorate of DCA, DECCO, the customers and numerous commercial companies. General functions of each of the first three are listed below:

The CSIF division is responsible for [Ref. 3: p. 2] :

(1) Preparing the CSIF annual program budget estimates and the operating budget submissions, and preparing financial management of budget justification reviews to higher authority.

(2) Developing and publishing planning rates, subscriber rates and standard rates for leased communications. They also provide timely programming and budgeting information necessary for budget submissions to customer activities.

(3) Approving and publishing DECCO overhead rates.

(4) Negotiating and preparing agreements and reimbursements procedures with the military departments for costs incurred in the operation and maintenance of switching centers and other DCS communications facilities to be reimbursed from the CSIF.

(5) Providing overall management and direction of the CSIF.

DECCO is responsible for [Ref. 3: p. 9] :

(1) Performing rate and tariff analysis to insure that the Federal Government is receiving the best rates and conditions possible for private line communications services.

(2) Maintenance of financial, contractual and operational data relative to DECCO contracts for leased commercial communications services.

(3) Design and implementation of accounting, disbursing, data processing, financing, and management control systems for the processing and reporting of leased commercial communications data, leased by DECCO.

(4) Development and provision of pertinent financial, contractual, and operational data by recurring management and financial reports.

The customers are responsible for [Ref. 9: p. ii]:

(1) Providing the necessary financial and access line data required by DCA for preparation of the CSIF annual program budget request and operating budget request and subsequent justification to the Secretary of Defense and the Office of Management and Budget (OMB).

(2) Providing the necessary access line data required for development by DCA of subscriber rates and planning rates.

(3) Providing manpower and cost data, with supporting justification, for the development of Interservice Support Agreements covering the reimbursement from the CSIF for operation and maintenance costs at switching centers and other DCS communications facilities.

D. ASSETS COVERED

There are two areas of reimbursables covered by the CSIF. One is the backbone programs. The other is all dedicated and special purpose leased requirements such as access lines, point-to-point circuits and terminal equipment. The two major assets funded by the CSIF are the AUTOVON and

AUTODIN backbone networks and access lines. The backbone network refers to the switches and trunks. As of 1 July 1975, DCA is also responsible for the operational management of the CONUS portion of the ARPANET. The ARPANET backbone falling under CSIF funding consists of the network Interface Message Processors(IMP's) and Terminal Interface Processors(TIP's), their interfaces, and the communications lines connecting them. The WWMCCS Intercomputer Network (WIN) also falls under the CSIF. Both WIN and the military portion of ARPANET will be incorporated in the Defense Data Network (DDN), also CSIF funded, when fully established. The Defense Switched Network (DSN) will be another CSIF backbone program when operational. The Washington Area Wideband System(WAWS) is a CSIF program as the Hawaii Area Wideband System(HAWS) will be when completed. [Ref. 3]

On 21 March 1973, the Secretary of Defense assigned the Director, DCA, the responsibility for centralized engineering and management of all nontactical off-base DOD multiplex systems. Two types of multiplexing systems are funded by the CSIF: the voice frequency carrier telegraph (VFCT) system and the channel packing systems. The last major asset funded by CSIF are the satellite services. [Ref. 9: p. 4-4]

The chart below shows a breakdown of systems and projected financing for fiscal year 1983 indicating the relative weight of each within the CSIF [Ref. 7: p. 6] :

SYSTEMS	($ In Millions)
AUTOVON System (backbone/access lines)	242.3
AUTODIN System (backbone/access lines)	90.2
Multiplex Backbone	10.8
Special Purpose Networks	311.7

The remainder of this thesis will be concerned primarily with the backbone assets falling within the purview of DCA and the CSIF. Budget and rate development procedures will address these specifically, while Chapter IV and V on CSIF discrepancies and alternatives will concentrate on these portions with some discussion on government-owned segments. The reason for this is that the costs of special purpose networks are billed directly to the users. Therefore, a number of the issues associated with the backbone network are not applicable.

E. THE CUSTOMERS

DECCO is responsible for procuring leased communications services from commercial carriers for all DOD agencies and authorized non-DOD departments and agencies. Table I provides a breakdown of all CSIF customers and revenue provided by them to the fund during FY83 and FY 84. As has already been indicated, revenues and leasing costs are expected to exceed $1 billion in FY 85. [Ref. 10] A more consolidated picture of how extensively various agencies are involved is provided by the FY 83 budget estimates listed below [Ref. 7: p. 6] :

CUSTOMER	($ In Millions)
Air Force	291.6
Army	123.1
Navy	95.3
Other DOD	47.0
Non-DOD	98.0

As will be seen in later chapters, the differences in dollars is not necessarily a function of the extent the services and other agencies use the DCS.

F. THE SUPPLIERS

DECCO and the CSIF maintain contracts with approximately 750 commerical companies and government agencies. Almost 300 of these organizations are individual state or regional telephone companies such as West Coast Telephone Company of California, United Telephone Company of Florida and Southern Bell Telephone Company. Another 50 are government agencies such as U.S. Information Agency, NASA and the City of St. Louis. The remaining involvement is with commercial companies ranging from the well-known such as ATT, GTE, Burroughs, Western Union, and the UNIVAC Division of Sperry Rand Corps, to the lesser knowns such as Terminal Unlimited and U.S. Instruments Rentals.

Foreign companies and organizations play a part as well. DECCO manages contracts with companies such as SIEMENS and deals with government agencies including the Royal Canadian Air Force and the Russian Telephone Company.

The range is extensive and the intricacies of contracting and leasing activities within DECCO are beyond the scope of this thesis. It will suffice to say at this point that all DOD instructions pertaining to acquisition apply. [Ref. 11]

G. GENERAL WORKINGS OF THE CSIF

Figure 2.1 illustrates the general cycle relating all elements of the fund. [Ref. 3: p. 6] As shown, the rotation occurs as follows:

(1) Customer requirements are received and evaluated by DECCO.

(2) DECCO orders the communications services from commercial companies.

(3) The services are provided by the commercial companies to the customers.

(4) The commercial companies bill DECCO.

(5) After verification of the bill, the commercial companies are paid by DECCO from the CSIF corpus.

(6) The customers are then billed monthly by DECCO based on predetermined subcriber rates.

(7) Accounts receivable are collected from the customers and returned to the corpus. Customer payments are drawn from their Operation and Maintenance appropriations.

The process itself appears quite straightforward. The complexity enters when addressing the issue of how it is determined who pays what. Since in most cases it is backbone costs that are at issue, a means was needed to spread these costs over all customers in an efficient manner. As was stated previously, there are two sides to the CSIF: the backbone programs and all dedicated and special purpose leased requirements. Costs for the backbone programs include initial and recurring costs for operation and maintenance of the switched networks. Included are special equipment and any termination charges. The CSIF is reimbursed for these cost through backbone subscriber rates. For all dedicated and special purpose leased requirements, the customer is billed for the actual leased cost. DOD Directive 7410.4R states that "Industrial funds will be used to finance the operating costs of major service units that produce goods and services in response to requirements of users...." [Ref. 5]. Therefore, the operating costs of DECCO must also be applied to all customers through the use

of an overhead rate. This rate, once determined, is included in the total subscriber rate applied to backbone costs and is in addition to the actual cost of leasing dedicated and special purpose assets. In essence there are two types of rates which must be determined by the CSIF division: the DECCO overhead rate charged to all subscribers and subscriber rates for each specific backbone program applied to the particular customers of that service. For non-DOD users an additional 0.25% is added to the overhead charge to cover the cost of military personnel. The money is collected through the CSIF and reimbursed to the appropriate services. [Ref. 3: p. 10]

Prior to fiscal year 1976, rates were adjusted throughout the year as changing circumstances dictated. This process required CSIF customer activities to reprogram funds to meet payments on increased rates. In FY 76, rate stabilization was implemented to alleviate the negative effect on customer budgeting and Operation and Maintenance funds. Once rates are established, they are unchanged for the appropriate fiscal year. Any necessary adjustments for bringing the funds profit or loss status to zero are included in subsequent fiscal year rates. Using stabilized rates also allows customers to include anticipated cost escalations in their budgets. Annual accounts are precluded from budgeting for inflation, however this does not apply to subscriber rates. An inflation factor is incorporated into all planning rates used by the CSIF.

The objectives underlying the determination of subscriber rates include the following [Ref. 3: p. 14] :

(1) Comply with appropriate DOD regulations

(2) Efficient basis for billing customers

(3) Flexibility for the Director, DCA to manage switched network service on a global basis, to maintain the most cost-effective networks

(4) Marketable to encourage departments where feasible, to use the switched networks rather than more expensive special purpose systems

(5) Serve as a management tool to department managers

(6) Fiscal stability to avoid unbudgeted reprogramming

(7) Simple for use in planning, programming, budgeting

(8) Cost effective and feasible to administer

(9) Capability to bill non-U.S. government users for total cost--(capital, operating and military personnel)

Chapter IV and V of this thesis will address these objectives while discussing the effects and problems associated with current CSIF policies. Some knowledge of rate development and budget procedures is needed however as a background to such an analysis. The steps involved in budgeting for the CSIF and rate determination are similar for all backbone programs though each is necessarily distinct due to unique characteristics of the system. The number of backbone programs involved prohibits an extensive evaluation of each, plus the discussion would become repetitive eventually. Due to the universal nature of the AUTOVON and AUTODIN systems, these two will be examined in detail in Chapter III.

TABLE I

Customers And Revenues

SOURCE OF REVENUE	FISCAL YEARS 1983 (000)	1984 (000)
MILITARY DEPARTMENTS	592,395	631,435
Air Force	349,782	359,923
Army	133,374	147,358
Navy	109,239	124,154
OTHER DOD DEPARTMENTS	97,560	119,591
DCA-Defense Communications Agency	51,603	59,629
DCSI-Defense Criminal Investigative Service	0	1
DLA-Defense Logistics Agency	13,621	14,179
DTS-Defense Telephone Service	10,681	10,960
OAS-Department of Commerce	31	0
DIS-Defense Investigative Service	186	195
DMA-Defense Mapping Agency	487	631
DNA-Defense Nuclear Agency	936	1,007
DIA-Defense Intelligence Agency	753	862
OSD-Office of Secretary of Defense	1,665	1,751
ARPA-Advanced Research Projects Agency	4,717	5,263
IAF-Armed Forces Information Services	10,306	22,246
SADS-San Antonio Data Services	384	(9)
CHAM-Civilian Health and Medical Program	3	18
WJMP-Worldwide Joint Project Manager	3	3
NGB-Air National Guard	2,184	2,708
NSEX-MODUK-Air S9D2, Middlesex, England	0	3
SARP-San Antonio Real Property	0	11
DLM-Defense	0	133
NSA - National Security Agency	8,097	8,316
SACA - Supreme Allied Commander - Atlantic	495	969
NON-DOD DEPARTMENTS	144,274	149,898
FAA-Federal Aviation Administration	135,615	137,055
ACDA-Arms Control Disarmament Agency	238	171
INS-Immigration/Naturalization Service	22	22
FBI-Federal Bureau of Investigation	94	836
DOJ-Department of Justice	57	54

Table 1
Customers and Revenues (cont'd.)

DOI-Department of Interior	602	241
HEW-Department of Health, Education and Welfare	11	23
NASA-National Aeronautics and Spcae Agency	270	285
NOAA-National Oceanic and Atmospheric Administration	121	124
CIA-Central Intelligence Agency	160	201
SHAP-Supreme Headquarters Allied Powers, Europe	34	38
DOT-Department of Treasury	81	602
GSA-General Services Administration	601	301
NWS-National Weather Service	426	429
USDA-Department of Agriculture	2	2
USIA-U.S. Information Agency	50	73
DOE-Department of Energy	410	499
NSF-National Science Foundation	15	17
CCGD-Coast Guard	4,197	4,557
WHCA-White House Communications Agency	0	3,146
MS-Department of Transportation	0	103
NBS-Navy Broadcasting Service	163	112
DOS-Department of State	502	436
JMAG-Joint Military Advisory Group	1	0
NOS-National Oceanigraphic Service	4	2
DAVA-Defense AudioVisual Agency	22	23
ERDA-Energy Research Development Agency	433	394
NIH-National Institute of Health	35	37
NLM-National Library of Medicine	107	112
DLG-Defense Liason Group,India	1	3
MAC-Military Airlift Command	3,533	3,489
NON APPROPRIATED CUSTOMERS	700	715
ATT-American Telephone and Telegraph Co.	171	153
ARC-American Red Cross	24	24
RCA-RCA Global Communications INC	22	25
CFCS-Canadian Forces Communications Services	368	367
WUII-Western Union International, INC	21	24
TRTT-Tropical Radio Telecommunications Corp	8	8
ITTW-ITT World Communications INC	6	6
EMBS-Ministry of Defense, London England	49	48
NFCU-Navy Federal Credit Union	31	60
TOTAL	847,054	914,413

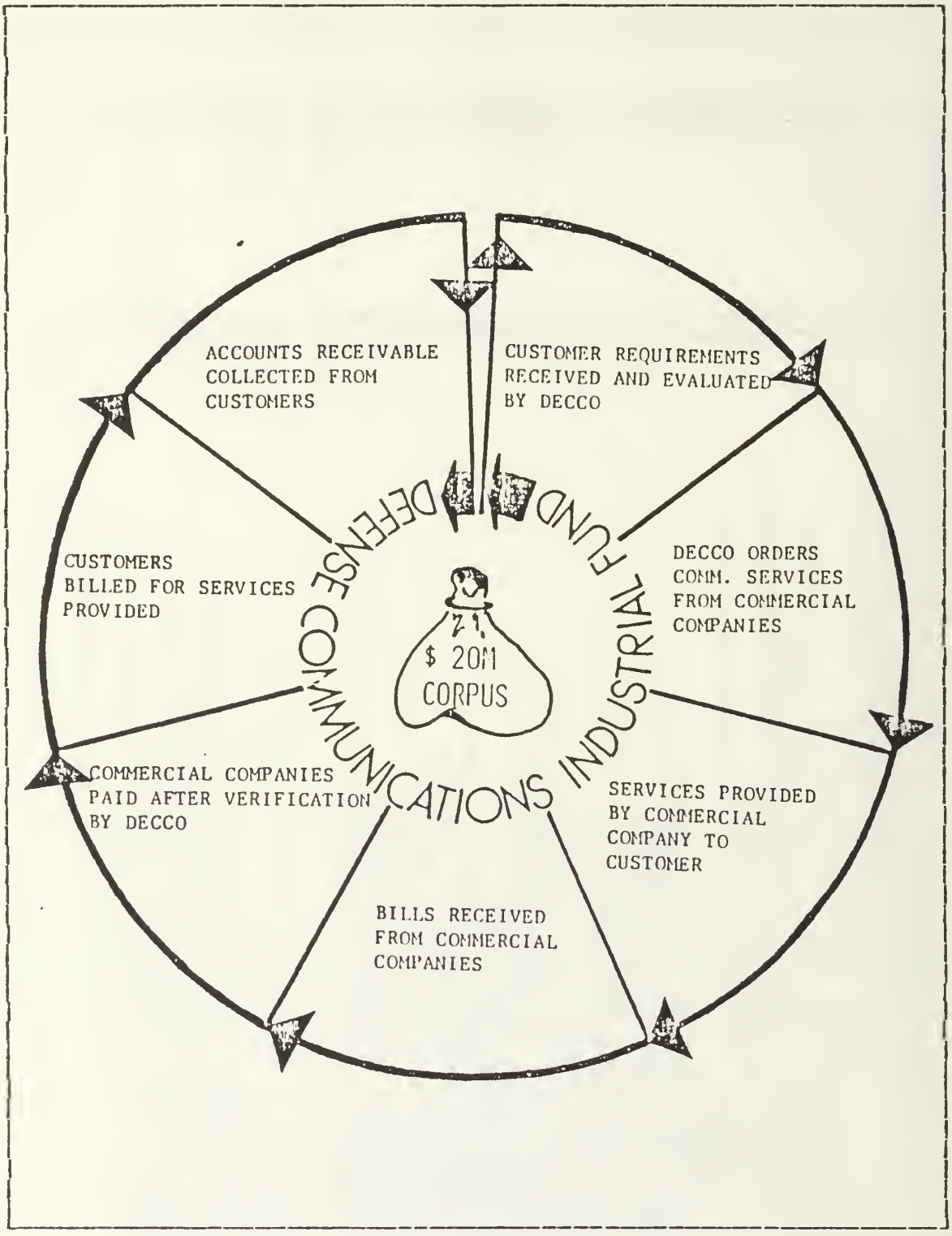

Figure 2.1 CSIF Cycle

III. BUDGET PROCEDURES AND RATE DEVELOPMENT

A. BUDGET PROCEDURES

The budget process for the CSIF is directly linked to that of its customers since the activity of the fund is determined by those customers. The major justification for the budget submission exists in stated customer requirements, with the remainder qualified by DCA's plans for the backbone networks. As for any organization within the DOD budgeting procedures can be broken down into long range planning and short term concern for the upcoming budget year submission, as well as proper apportionment of the budget currently under consideration by Congress. A complete discussion of the total budgeting process of the DOD is not the purpose of this section. Only those aspects which are pertinent or unique to the CSIF will be examined. One point to be made before beginning is that budgeting for the CSIF is a crucial aspect of the entire DOD Operations and Maintenance (O&M) appropriation budget process. In FY83, the CSIF O&M requests were 72% of the total DOD requests. The CSIF accounted for 73% of the total O&M requirement in the DOD Five Year Program. [Ref. 7: p. 14].

A long range budgeting program resides in the DCS Planning, Programming and Budgeting System (PPBS) which is a subsystem of the DOD PPBS process and the Five Year Defense Plan (FYDP) Telecommunications Subsystem. The DCS PPBS both contributes and reacts to the overall DOD PPBS process, as do all DOD component procedures. Throughout the steps a DCS plan is being formulated and updated, defining the DCS objectives for a 10-year period and requirements for a 5-year period. Modifications are made in requirements as a

result of fiscal constraints established and identification of objectives that will or will not be supported in the overall DOD planning.

Actual budget year considerations are based on submission of the DCS Five Year Program and DOD components' Program Objective Memoranda (POMs) proposed distribution of resources to the DCS. After review of these reports, OSD issues a Program Decision Memorandum (PDM) for the Consolidated Telecommunications Program (CTP). Using this PDM as guidance, DOD components then submit DCS budget estimates for incorporation in the CTP budget recommended to SECDEF. The process continues with submission of the President's budget, Congressional action and the apportionment process within OSD.

In a narrower sense, looking at only the budget year of concern vice long range planning processes, the customers and DCA are even more closely tied together in the determination of budget estimates and required reports. Yearly budget estimates for the CSIF require extensive input from customers in order to determine both subscriber rates and DECCO overhead rates, which are the basis for revenue estimates included in the budget submission. In turn, planned CSIF rates are integral to customer's O&M requests for telecommunications funding.

DECCO is required to develop for Headquarters DCA, annual budget estimates to include estimated operating costs of the division for use in determining planning overhead charges. In addition, annual budget calls to all CSIF customer activities supply estimates of leased communications services to be procurred through the fund. Customer estimates are based on planning subscriber rates which are provided for the fiscal year in question plus four subsequent years. Inputs are analyzed and used by DCA to prepare the CSIF budget which is submitted to the Assistant Secretary of Defense (Comptroller)- ASD(C).

At the same time, customers are preparing their own budget submissions to ASD including O&M requests for payments to the CSIF. Estimates are based on the planning rates which have been provided by DCA based on past customer inputs. DOD component telecommunications budget submissions impacting the CSIF are provided to DCA by OSD for review and the preparation of analyses and recommendations. DCA representatives participate in the CSIF and DOD component operations budget hearings conducted jointly by OMB and ASD representatives. One important factor that must be addressed during the OMB hearings is that CSIF submissions and customer O&M fundings requests must be adjusted in concert as programs are cut or funds added.

In addition to coordination of this process, the CSIF program and financing data must be prepared for submission with the President's budget in January. The package provides detailed analysis of obligation rates and balances, financial condition, statements of revenue and expense, analysis of Government equity, and various other supporting schedules covering all aspects of the CSIF actual and projected operations.

One distinction of the budgeting process for the CSIF, as for all industrial funds, is that the primary purpose is not competition for funds, but a means of reporting fund position, future actions and development of rates. All industrial funds reports are consolidated in a submission to Congress. Table II through VII provide examples from the FY 84 submission to Congress. Tables II through IV are a consolidated financial profile of all five DOD industrial funds. They provide details on the total industrial fund picture within the Defense Department. Tables V through VII show the same information for the Defense Industrial Fund alone. Note that the Defense Industrial Fund includes both the CSIF and the Defense Clothing and Textile Center. The

CSIF is not broken out by itself. The submission to Congress includes similar breakdowns for the other four funds plus civilian personnel figures for all funds. [Ref. 4: pp.4-6,19-21]

While the budget is before Congress for consideration, the apportionment process is beginning. Funds must be allocated to CSIF customers O&M accounts for payment of telecommunications services and information must be gathered for final development of overhead and subscriber rates. DECCO provides DCA with an estimate of the cost of the operation of DECCO for development of the overhead rate to be charged CSIF customer activities. Customers provide updated access line forecasts incorporating changes made by Congress and other reviewing activities to the annual budget, for use in determining subscriber rates which must be approved by ASD(C). Prior to the beginning of the new fiscal year, apportionment hearings are held, O&M funds are allocated, and submitted rates are approved. As will be seen later the budget process, both procedures and timing, can be troublesome to the CSIF and its customers.

B. RATE DEVELOPMENT - AUTOVON

The rates charged customers for backbone services are the mainstay of the CSIF. As was seen in Chapter II, Section D, total backbone services accounted for approximately 52% of fund activity in FY 83 with approximately 51% attributed to AUTOVON and AUTODIN services alone. Considering the significance of these activities, the development of the rates are of equal importance since it is through these rates that costs are recouped. Accurate reflection of costs in the rates are necessary in order to sustain the fund at its zero profit or loss status. As will be seen in Chapter IV, rate determination also plays an

important role in structuring the system and influencing customer behavior.

Rates are developed for AUTOVON using access fees based upon capability, which is determined from three characteristics. The first two are directionality and precedence. There are three ways in which access lines can be configured: two-way, one-way in, and one-way out. Four precedences are available: routine, priority, immediate and flash. An arbitrary weighted unit is assigned to each line based on its composite capability as indicated below [Ref. 12: p. 6] :

	Routine	Priority	Immediate	Flash
One-way out	2	4	6	8
Two-way	1	2	3	4
One-way in	0	0	0	0

Note that two-way lines are weighted at half that of one-way out, one-way in lines are not weighted at all and units increase with increased precedence. These assignments are due to several underlying assumptions. One-way out lines are considered to generate twice as many calls as two-way since they are never occupied by incoming calls. One-way in lines are not priced since they are looked upon as reducing congestion by taking calls off the network as opposed to contributing to network congestion by adding calls. Units increase by precedence as a result of additional requirements needed and the ability to capture a larger share of the network capacity. Chapter IV will look at these assumptions again while analyzing their validity and effect. [Ref. 12]

The third factor considered under capability is area. Four areas are designated for cost allocation: CONUS,

Pacific, Europe and Caribbean. In addition, the interconnection between the areas must be taken into account resulting in seven cost pools to which geographical costs are allocated: CONUS, CONUS-Europe, Europe, CONUS-Pacific, Pacific, CONUS-Caribbean and Caribbean. Maximum calling areas (MCA's) for each line are also figured into cost allocation. The following MCA's are available [Ref. 9: pp. 4-2,4-3] :

LOCAL: Limited to traffic between subscribers within the following geographical areas of the Pacific and Europe:

(1) United Kingdom
(2) Germany and Belgium
(3) Mediterranean Area (Spain, Italy, Greece, and Turkey)
(4) Panama
(5) Hawaii
(6) Taiwan, Okinawa, Philippines, and Southeast Asia
(7) Taiwan, Okinawa, Japan, Philippines, and Southeast Asia
(8) Taiwan, Okinawa, Japan, and Korea
(9) Taiwan, Okinawa, Japan, and Philippines

AREA: Limited to traffic between subscribers served through a complex of switching centers within the complete geographic areas of either Europe, Pacific, or CONUS.

AREA PLUS CONUS OR OVERSEAS: This service is available to subscribers in CONUS that have access to both the CONUS area and an overseas area. In addition, this service is available to overseas subscribers having access to both the area serving that geographical location and the CONUS. It is not available to subscribers in CONUS not having access to an overseas area and CONUS. The three overseas areas having Area Plus subscriber service are Europe, Pacific, and Caribbean.

GLOBAL: Provides access to any subscriber in the world-wide AUTOVON network, unlimited by geographical location.

CADIN: Continental Air Defense Integration North rates apply to access lines originating in Canada that are homed on continental U.S. AUTOVON switching centers.

In order to determine a cost per weighted unit per area, costs and weighted units are aggregated by area. A division of one by the other provides the subscriber rate. This rate may be adjusted up or down in order to make up for prior years' losses or gains. Table VIII provides an example of this process. The top half of the table is a breakdown of backbone costs by area. Cost factors are indicated on the left. The bottom half of the table is a compilation of weighted units segregated by area and MCA. These values are obtained from access line estimates submitted by customers during the budget process. Each figure is calculated by taking each access line and multiplying it by its appropriate weighted unit based on directionality and precedence. The lines for each customer are then separated by area, placed in the correct slot and summed. For example, there is a total of 14,676 weighted units in CONUS having a calling area capability of CONUS-Pacific. This number was computed by taking all customers in CONUS with an MCA of CONUS-Pacific, multiplying each line by the correct weighted unit and summing. Once the summary of costs and weighted units has been completed, the subscriber rate for each area can be determined by dividing the cost per area by total weighted units per area. [Ref. 12: p. 8]

The charge for any given access line is determined by summing the applicable area and inter-area costs per weighted unit and multiplying the total by the number of weighted units assigned to that line. For example, using table VIII again, a two-way access line having immediate

precedence and area plus capability for CONUS and the Pacific must share in the costs for CONUS, $253, CONUS to Pacific, $206, and Pacific, $340 for a total of $799 per weighted unit. A two way line with immediate precedence is assigned a weighted unit of 3, giving a total charge for the line of $2397. In the case of a global area line its total cost per weighted unit would be determined by summing the costs per weighted unit of all seven areas.

Projected rates must be set for customers several years in advance. In order to estimate costs and total weighted units per area, forecasts of access lines to be used must be obtained from customers. In May of each year, DCA requests this information on access lines for current, program and budget year. Subscribers must provide data estimates on end of year line numbers and type and average line use throughout the year. This information combined with others can then be used to determine subscriber rates and subsequently total revenue that can be expected from each customer.

A clarification concerning all subscriber rates should be made before continuing. Though these rates are developed using access line characteristics, it must be remembered that they are not a charge for these lines. Line charges are paid directly by each user. The rates, though based on access lines, are a means of distributing the costs of the jointly used backbone networks.

C. RATE DEVELOPMENT - AUTODIN

AUTODIN rate development is similar to that of AUTOVON in that total costs of the system must be determined based on aggregate access line connections and total weighted units for the system must be calculated using a system of applying weights to some measurable system attribute. For

AUTODIN, the line characteristic used is line speed since it is this factor that determines the amount of Accumulation and Distribution Unit (ADU) data memory required. The ADU interfaces between the central processing unit of the AUTODIN switch and incoming and outgoing channels and is the first constraint on switch capacity. The interface is necessary to establish compatibility between sending and receiving subscriber equipment due to different transmission rates. Because the magnetic core storage elements of the ADU are scanned at a fixed rate and the CPU operates at internal speeds faster than sending or receiving subscriber equipment, differing amounts of ADU data memory are required for differing speed access lines. [Ref. 13: pp. 7-8] Weighted units are assigned to the access lines in proportion to the amount of ADU space required by them. Current weighted unit assignments are as follows [Ref. 3: p. 16] :

BAUD RATE	WEIGHTED UNIT
4800	12
2400	8
1200	6
600	4
300 and lower	2

In order to calculate AUTODIN subscriber rates, two pieces of information are required: total cost and total weighted units. Total weighted units are obtained by soliciting forecasted access line utilization from customers. Input is given for current, program and budget year in the form of end year estimates and average line year estimates. The average year line estimates are multiplied by the applicable weighted unit for baud rate and then by 12 in order to transition from monthly data to yearly. The necessity for this last step is dependent upon whether forecasts

provided are monthly or yearly estimates. Total weighted units for a given customer are then summed over all baud rates. This process must be repeated for all subscribers to tally total system weighted units. Total backbone costs are computed based on backbone expenses including costs of the switching centers, trunks, AUTODIN interconnects, an inflation factor, plus the DECCO overhead charges. Dividing costs by total weighted units gives the subscriber rate or cost per weighted unit. As with AUTOVON this may be adjusted based on previous years profits or losses. Tables IX through XI illustrate the process just described. Table IX is an example of one customer's access line forecast. This particular example is on a monthly basis. Table X shows the calculation of one customer's total weighted units. Note that it is the average line estimates from the budget year that are used. This same procedure would be repeated for all customers and the values summed to provide the total number of AUTODIN weighted units for the year in question. Table XI provides a breakdown of AUTODIN backbone costs. The subscriber rate is determined by dividing total costs by total weighted units. Once the rate is available, the cost for a given line can be calculated by multiplying this rate by the appropriate weighted unit of the line based on baud rate. [Ref. 3: pp. 15-17].

This chapter has detailed the current practices in rate development and budget procedures. These steps have been the basic procedures since the inception of the fund, but questions exist as to whether the status quo serves all involved, including the system itself, to the best advantage. The next chapter investigates this premise.

TABLE II

Industrial Funds Submissions To Congress - A

DEPARTMENT OF DEFENSE
INDUSTRIAL FUND SUMMARY
Program and Financing (in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Program by activities:			
Costs of goods and services produced:			
Army	2,831,727	3,092,200	3,171,600
Navy	11,886,588	12,616,700	13,296,000
Marine Corps	69,482	78,700	82,600
Air Force	5,600,173	6,120,900	6,453,700
Defense	746,972	818,400	859,800
Total costs of goods and services produced	21,134,942	22,726,900	23,863,700
Adjustment of prior year expense	-33,648	.....	.....
Total program costs	21,101,294	22,726,900	23,863,700
Change in selected resources	1,605,771	92,300	189,600
Adjustment in selected resources	-2,439	33,800	5,800
Total program (obligations)	22,704,626	22,853,000	24,059,100
Financing:			
Offsetting collections from:			
Federal funds	-21,646,065	-22,701,744	-23,365,594
Trust funds	-150,389	-244,456	-256,406
Non-Federal sources	-100,442	-91,400	-92,800
Recovery of prior year obligations	-56,482	.....	.....
Unobligated balance available, start of year	-3,177,432	-2,426,182	-2,610,782
Unobligated balance available, end of year	2,426,183	2,610,782	2,266,482
Budget authority	.....	.....	.....
Relation of obligations to outlays:			
Obligations incurred, net	807,730	-184,600	344,300
Receivables in excess of obligations, start of year	-2,196,215	-1,718,464	-1,807,664
Receivables in excess of obligations, end of year	1,718,464	1,807,664	1,008,464
Adjustments in unexpired accounts	-56,482	.....	.....
Outlays	273,497	-95,400	-454,900

TABLE III

Industrial Funds Submissions To Congress - B

DEPARTMENT OF DEFENSE
INDUSTRIAL FUND SUMMARY
Financial Condition (in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Assets:			
Selected assets:			
Fund balance with Treasury..	707,719	803,119	1,258,019
Accounts receivable (net)...	934,260	941,334	971,597
Advances made.....	220,919	231,684	254,466
Inventories.....	1,707,864	1,647,782	1,668,640
Other assets.....	707,661	708,424	694,610
Capital Property (Net).....	4,166,361	4,668,785	5,051,413
Total assets.....	8,444,784	9,001,128	9,898,745
Liabilities:			
Selected liabilities:			
Accounts payable and accrued liabilities.....	2,879,804	2,959,451	2,984,261
Advance received.....	129,594	112,216	113,164
Unfunded liabilities.....	228,250	219,044	223,899
Other liabilities.....	230,117	110,106	88,561
Total liabilities.....	3,467,765	3,400,817	3,409,885
Government equity:			
Selected equities:			
Unexpended budget authority:			
Unobligated balance.....	2,426,183	2,610,782	2,266,482
Undelivered orders.....	4,668,964	4,999,655	5,124,006
Unfinanced budget authority:			
Unfilled customer orders..	-7,449,043	-7,835,376	-7,239,659
Invested capital.....	5,330,915	5,825,250	6,338,031
Total Government equity...	4,977,019	5,600,311	6,488,860
Total Liabilities and Equity....	8,444,784	9,001,128	9,898,745

TABLE IV

Industrial Funds Submissions To Congress - C

DEPARTMENT OF DEFENSE
INDUSTRIAL FUND SUMMARY
Revenue and Expense and Changes in Government Equity
(in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Revenue and Expense:			
Revenue:			
Sale of goods and services.	20,365,548	25,955,000	24,136,800
Expense:			
Materials, supplies, and parts used.....	5,081,255	5,234,697	5,363,759
Salaries and wages.....	7,936,085	8,207,638	8,321,029
Contractual services.....	7,619,360	8,189,207	8,925,483
Other expenses.....	498,242	1,095,358	1,253,429
Cost of goods and services produced.....	21,134,942	22,726,900	23,863,700
Work in process increase (-) or decrease.....	-554,210	3,153,800	-86,900
Cost of goods and services sold.....	20,580,732	25,880,700	23,776,800
Net income or loss (-) for the year.....	-215,184	74,300	360,000
Analysis of changes in Government equity:			
Paid-in capital:			
Opening balance.....	4,573,196	4,950,211	5,928,855
Transactions:			
Assets/liabilities capitalized (-) decapitalized.....	71,117	548,992	528,549
Other transfers.....	305,898	429,652	40,282
Closing balance.....	4,950,211	5,928,855	6,497,686
Retained income or deficit (-):			
Opening balance.....	516,613	26,808	-328,544
Transactions:			
Net operating income or loss (-).....	-215,184	74,300	360,000
Adjustment of prior year revenue and expense.....	31,277	.....	.....
Other transfers.....	-305,898	-429,652	-40,282
Closing balance.....	26,808	-328,544	-8,826
Total Government equity (end of year).....	4,977,019	5,600,311	6,488,860

TABLE V

Industrial Funds Submissions To Congress - D

DEPARTMENT OF DEFENSE
DEFENSE INDUSTRIAL FUND
Program and Financing (in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Program by activities:			
Costs of goods and services produced:			
Clothing and textile center	27,759	29,700	30,200
Communications services	719,213	788,700	829,600
Total costs of goods and services produced	746,972	818,400	859,800
Adjustment of prior year expense	-11,605	.....	.....
Total program costs	735,367	818,400	859,800
Change in selected resources	15,455	.....	.....
Adjustment in selected resources			
Total program (obligations)	750,822	818,400	859,800
Financing:			
Offsetting collections from:			
Federal funds	-725,347	-800,900	-854,500
Non-Federal sources	-701	-700	-700
Unobligated balance available, start of year	-73,613	-48,838	-32,038
Unobligated balance available, end of year	48,839	32,038	27,438
Budget authority			
Relation of obligations to outlays:			
Obligations incurred, net	24,774	16,800	4,600
Receivables in excess of obligations, start of year	78,643	23,910	34,310
Receivables in excess of obligations, end of year	-23,910	-34,310	-32,910
Outlays	79,507	6,400	6,000

TABLE VI

Industrial Funds Submissions To Congress - E

DEPARTMENT OF DEFENSE
DEFENSE INDUSTRIAL FUND
Financial Condition (in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Assets:			
Selected assets:			
Fund balance with Treasury..	72,749	66,349	60,349
Accounts receivable (net)...	72,687	47,355	37,555
Inventories.....	4,687	3,891	3,891
Other assets.....	864	519	519
Capital Property (Net).....	9,985	10,385	11,285
Total assets.....	160,972	128,499	113,599
Liabilities:			
Selected liabilities:			
Accounts payable and accrued liabilities.....	104,158	87,989	76,789
Other liabilities.....	.....	296	296
Total liabilities.....	104,158	88,285	77,085
Government equity:			
Selected equities:			
Unexpended budget authority:			
Unobligated balance.....	48,838	32,038	27,438
Undelivered orders.....	29,945	29,745	29,745
Unfinanced budget authority:			
Unfilled customer orders..	-36,560	-36,346	-36,346
Invested capital.....	14,591	14,777	15,677
Total Government equity...	56,814	40,214	36,514
Total Liabilities and Equity....	160,972	128,499	113,599

TABLE VII

Industrial Funds Submissions To Congress - F

DEPARTMENT OF DEFENSE
DEFENSE INDUSTRIAL FUND
Revenue and Expense and Changes in Government Equity
(in thousands of dollars)

	1982 Actual	1983 Estimate	1984 Estimate
Revenue and Expense:			
Revenue:			
Sale of goods and services.	729,085	801,400	855,200
Expense:			
Materials, supplies, and parts used.....	2,974	3,262	3,466
Salaries and wages.....	27,370	28,989	30,516
Contractual services.....	716,397	785,022	824,611
Other expenses.....	231	1,127	1,207
Cost of goods and services produced.....	746,972	818,400	859,800
Work in process increase (-) or decrease.....	-440	.....	.....
Cost of goods and services sold.....	746,532	818,400	859,800
Net income or loss (-) for the year.....	-17,447	-17,000	-4,600
Analysis of changes in Government equity:			
Paid-in capital:			
Opening balance.....	33,449	33,477	33,877
Transactions:			
Assets/liabilities capitalized (-) decapitalized.....	28	400	900
Other transfers.....	.....	.....	.....
Closing balance.....	33,477	33,877	34,777
Retained income or deficit (-):			
Opening balance.....	40,046	23,337	6,337
Transactions:			
Net operating income or loss (-).....	-17,447	-17,000	-4,600
Adjustment of prior year revenue and expense.....	738	.....	.....
Closing balance.....	23,337	6,337	1,737
Total Government equity (end of year).....	56,814	40,214	36,514

TABLE VIII

AUTOVON Backbone Rate Calculation

Costs by Geographic Area	Area							
Item	CONUS	CONUS-Europe	Europe	CONUS-Pacific	Pacific	CONUS-Caribbean	Caribbean	Total
1. Service Observing	202	--	--	--	--	--	--	202
2. Operators	129	--	--	--	--	--	--	129
3. Directory	36	--	12	--	12	--	3	63
4. Leased Switches	3,169	--	52	--	1,279	--	--	4,500
5. Trunks	51,558	6,659	555	5,357	9,845	1,485	--	75,459
6. O&M of Owned Switches	--	--	678	--	562	--	57	1,297
7. Other Costs and Adjustments (Net)	2,978	144	96	357	733	108	5	4,421
Adjusted Cost Totals	$58,072	$6,803	$1,393	$5,714	$12,431	$1,593	$65	$86,071

Rate Base By Weighted Units	Weighted Units Per Area							Total Weighted Units
Maximum Call Area	CONUS	CONUS-Europe	Europe	CONUS-Pacific	Pacific	CONUS-Caribbean	Caribbean	
1. Europe-Local	--	--	840	--	--	--	--	840
2. Europe-Area	--	--	16,344	--	--	--	--	16,344
3. Pacific-Local	--	--	--	--	324	--	--	324
4. Pacific-Area	--	--	--	--	8,508	--	--	8,508
5. CONUS-Area	189,600	--	--	--	--	--	--	189,600
6. CONUS-Europe	9,384	9,384	9,384	--	--	--	--	9,384
7. CONUS-Pacific	14,676	--	--	14,676	14,676	--	--	14,676
8. CONUS-Caribbean	2,760	--	--	--	--	2,760	2,760	2,760
9. Global	13,056	13,056	13,056	13,056	13,056	13,056	13,056	13,056
Total	229,476	22,440	39,624	27,732	36,564	15,816	15,816	255,492
Rate Per Weighted Unit = A/8 ($ Rounded for Service Shown)	$253	$303	$35	$206	$340	$101	$4	$1,242 (Global)

TABLE IX

AUTODIN Access Line Forecast

JTODIN	CURRENT YEAR	PROGRAM YEAR		BUDGET YEAR	
	END OF YR EST.	END OF YR EST.	A/L YRS AVG.	END OF YR EST	A/L YRS AVG.
4800 BAUD	30	44	37	46	45
2400 BAUD	40	46	43	77	62
1200 BAUD	82	95	89	86	91
600 BAUD	41	38	40	29	33
300 & LOWER	233	241	236	234	238
TOTAL	422	464	445	472	469

TABLE X

AUTODIN Analysis Of One Customer

AUTODIN	BUDGET YR. A/L YRS AVG.	X	WEIGHTED UNIT ASSIGN.	X 12 MONTHS	TOTAL WT. UNITS
4800 BAUD	45	x	12	x 12	6,480
2400 BAUD	62	x	8	x 12	5,952
1200 BAUD	91	x	6	x 12	6,552
600 BAUD	33	x	4	x 12	1,584
300 & LOWER	238	x	2	x 12	5,712
TOTAL	469				26,280

TABLE XI

AUTODIN Cost Analysis

BUDGET YEAR

DESCRIPTION	NUMBER	COSTS
PROGRAM DATA		
NUMBER OF OPERATIONAL SWITCHES (E/Y)		
CONUS	8	xxx
OVERSEAS (INCLUDING HAWAII)	7	xxx
EXPENSES		
SWITCHING CENTERS		
LEASED SWITCHES		24,900
COMMERCIAL REFILE		640
AMORTIZATION		---
O&M OF SWITCHING CENTERS		16,890
DEPOT MAINTENANCE (OVERSEAS)		400
OTHER AND NON-RECURRING		490
TOTAL SWITCHING CENTERS		43,320
TRUNKS:		
CONUS (LEASED)	19	520
EUROPE (CHANNEL PACK)	16	850
PACIFIC (LEASED)	4	480
PACIFIC (CHANNEL PACK)	7	410
TOTAL TRUNKS	46	2,260
AUTOVON INTERCONNECTS:		
CONNECTION COSTS		129
AUTOVON SUBSCRIBER RATES		1,672
TOTAL AUTOVON INTERCONNECTS		1,801
INFLATION FACTOR ADD-ON	(5.1%)	2,416
OVERHEAD		602
TOTAL AUTODIN I BACKBONE EXPENSE		50,199

IV. ANALYSIS OF CURRENT CSIF PRACTICES

A. BENEFITS OF THE FUND

Chapters I through III have dealt with background material on the CSIF. Its objectives and mechanics have been discussed. Very few functions exist without faults, however, and even the best can benefit from scrutiny. Over time, the emergence of new policies, studies or technologies may require a rethinking of objectives and alteration of existing procedures. The CSIF is no exception to this. This is not meant to imply that the fund has not performed within expections but that there are areas that have been identified for improvements. Before looking at these issues, an iteration of the benefits of the fund should be considered to put things in perspective.

The principal reason for the establishment of industrial funds was to promote a business like buyer-seller relationship within the DOD for appropriate activities. Measurement of success in this area is difficult in that business practices do not extend to making a profit, the normal means of comparing accomplishments in the business community. Questions as to whether the CSIF does indeed aid in reducing costs or inducing the "buyer" activity to greater efficiency have no quantifiable answers. Comparisons with the past are not possible since the CSIF and combined communications assets evolved together. Though precise evaluation is not possible, it seems intrinsic to the concept of industrial funding that benefits would accrue.

The primary activity of the fund is concentrated in jointly used backbone systems such as AUTOVON, AUTODIN, ARPANET, WIN and commercial satellites. Logic dictates that

for the sake of simplicity and efficiency a common point of contact for leasing requirements and subsequent payments is required. A consolidated communications effort requires such centralization unless the responsibility of each system is parceled out to individual services or other agencies involved. The duplication of effort inherent in this alternative method is easily envisioned. Each organization would require its own experts in acquisition policies, tariff analysis and communications regulations, as well as many others. The situation would also require a multitude of industrial funds to accomplish the same purpose being served now.

There are many other reasons which exemplify the benefits offered by the CSIF. The ability to take advantage of reduced rates due to bulk leasing is present in the current system. An obvious example of this is the Telpak rates offered by AT&T during the 1960's and 70's. It also provides a means of centralized accounting and record keeping allowing for totaling long-haul communications costs within the DOD and then distributing these costs back to the users on a predetermined basis. Advantages of rate stabilization have already been discussed. Such a program would not be possible without the CSIF, leaving the services vulnerable to fluctuations in prices. The advantages realized by rate stabilization can be seen in Figure 4.1.. [Ref. 3: p. 31]. Prior to 1975, the year the rate stabilization program began, the CSIF was able to remain quite close to its target of no profit or loss. As has already been discussed, however, this was at a cost to customers of rate changes throughout the year requiring reprogramming of funds. The insulation provided by rate stabilization is evident in the post 1975 period. Though the fund itself must work from year to year to offset previous years' discrepancies, the customers are no longer subject to

constant changes. The point to be made is that the CSIF allowed for correction of an identified problem. Without it, there would have been no simple way of protecting O&M funding from the disruptions that existed.

The CSIF also offers an avenue for coordination between DCA and all user agencies of DCS. The budget process and rate development procedures described in Chapter III requires close cooperation between all involved. Intentions must be known in order to match O&M funding requests with expected activity and rates. The ability for DCA to influence DCS architecture and users through pricing policies is also contained in the CSIF.

The provisions for cost collection and allocation, system coordination and using pricing policies to the benefit of the DCS are in place. However, it can be argued how effectively they have been used and whether existing procedures are sufficient for accomplishing the intent. This idea will be examined further in the remainder of this chapter.

B. MANAGEMENT ISSUES

There is no doubt that the CSIF is a valid method of financing the DCS and that its operations are advantageous in many respects. As was pointed out at the beginning of this chapter, however, every system is open to revision if areas are found that are not performing as first planned. Many studies have been conducted over the years in an effort to highlight the shortcomings of the CSIF. The remainder of this chapter will deal with two areas of concern: factors effecting the management of the DCS and causes of inefficient operation of the systems. Though this is somewhat of an artificial separation, since there is an interplay between the two, the first is more interested in the ability

to obtain needed information and execute adequate control, whereas, the second is concerned with the allocation of costs and the effects on the systems resulting from the incentives created by the allocation. Rather than include solutions to discrepancies discussed here, they will be saved for the following chapter. The issues addressed in this section have been primarily extracted from reference 7.

The present method of financing restricts lease versus buy flexibility virtually locking in the decision once it has been made. Changes in needs, prices or revision of a program now require time consuming appropriation transfers or O&M reprogramming actions. If an initial determination is made by one of the services to buy a specific item, that cost is funded through a procurement appropriation. If, at a later date, it is decided that leasing the item through DECCO is more advantageous, the funds authorized for procurement are no longer of use since communications leases are paid for through O&M appropriations. The service's only options are to proceed with the purchase, despite the decision in favor of leasing, or to delay the project until O&M funding is made available. The same situation exists if a decision is initially made to lease with a later determination that the item should be purchased. This problem is not confined to individual agency's requirements but extends thoughout the whole of the DCS. Most equipment purchased for DCS, such as satellites, is done so through various users' procurement authorizations. The situation is compounded in these cases in that procurement funds are locked into one agency's appropriations, when what is needed is O&M money for all that are going to be using the service.

Another problem area involves cost allocation practices. Though issues of efficiency are also encountered here, they will be looked at in a later section leaving management questions for now. There are four causes of concern in

dealing with cost allocation practices which should be considered. The following list outlines these areas.

(a) Capital equipment and O&M requirements of the DCS are financed principally by the military departments, as just described. The services of the DCS, however, are used by a variety of agencies, both DOD and non-DOD.

(b) Military personnel costs are excluded from DCS cost allocations. This is an issue due to the fact that operations of the various switching centers associated with the DCS are spread among the various services. The present system requires the Military Departments involved to incorporate the costs of military personnel at these facilities into their own cost structures.

(c) Subscribers who primarily make use of government owned facilities, as opposed to leased services, virtually pay no costs.

(d) Amortization of capital equipment costs are not allowed except for small amounts. Budget distortions result since costs cannot be budgeted for evenly throughout the useful life of the equipment, complicating accurate cost analyses and program justification.

The primary result of allocating costs in this manner is that the true cost of the DCS is hidden. As a result, cost analyses of individual organizations requirements are distorted in lease versus buy decisions which compounds the problem of inflexibility just discussed. The budget process is also effected in that a disproportionate amount of the financing must be obtained by only a few of the actual users. This is not a problem in itself except when

difficulties arise in getting disproportionately high budget requests through Congress. Also, DCA bears the responsibility for the totality of the system, yet is required to deal with fragmented cost data across departmental lines. There is currently no central data base fascilitating cost comparisons between the DCS, other federal agencies, and industry costs for telecommunications. Inadequate cost visibility also prohibits identification of DCS costs to the appropriate force misssions, associated with the budget, which use DCS telecommunications capability.

Furthermore, DCA must accomplish its planning and programming within the constraints of no identifiable fiscal target. Available financing depends on customer O&M allocations. Unnecessary work can occur only to find that inadequate financing will exist from DCS user components. DCS requirements are dependent on each military departments' program and budget review process. As such, the needs of the DCS must compete with priorities and requirements within each department. The budget evolution for any of the DOD departments is a long and often confusing process. Budgeting for the DCS through the CSIF is even more so considering the number of players that must take part. One advantage always discussed in connection with industrial funds is that the activity is insulated from the appropriation battle for money. As has just been pointed out, this is in reality a mixed blessing in that they are also denied the opportunity to justify financing deemed necessary for the DCS, since this is incorporated into the requests of a variety of departments and agencies. A situation has been created whereby there is no single voice of justification for a system that was devised to provide centralization.

Recalling the budget procedures from Chapter III, an integral part of the process was the determination of rates based on projected costs and projected number of access

lines. These estimates were used by DCA in the development of required reports submitted to Congress and in the calculation of subscriber rates. The rates are used by customers for two purposes. At one point in time they are used by subscriber for their own planning purposes in developing O&M requests for the support of DCS requirements. Later they are used to determine actual payments to the CSIF. There are several difficulties relating to this procedure that have developed over the years.

One problem is that rates are developed prior to use based on projected average number of lines. The current system has built into it an incentive to overestimate access line forcasts. By doing this, the denominator for the subscriber rate is increased making the rate for all subscribers smaller. Throughout the year, for those subscribers who have overestimated access line connections, smaller payments to the CSIF are required and the extra O&M funds are now available for other purposes. In addition, the CSIF falls short in recouping its costs for that year due to the establishment of rates less than required. It should be obvious that the CSIF's deficit is equal to the "profit" made by those customers overestimating their demand. [Ref. 13: pp. 63-67]

The trend for AUTODIN can be seen in Table XII. [Ref. 13: p. 66]. Prior to 1975 budgeted forecasts were quite close to actual usage. From 1975 on, this has not been the case. It seems that a potential explanation for this lies in the fact that 1975 was the year the rate stabilization program was instituted. Prior to this, rates could be adjusted to meet changing circumstances, including demand. This is no longer possible with rates changing only once a year at the same time new O&M funds are appropriated.

The foregoing is not meant to imply that all customers are intentionally overestimating requirements. There are

definitely legitimate reasons for discrepancies between budgeted and actual needs. However, it is also true that there is no interest in underestimating demand since the effect on rates and O&M funds is the reverse of that described above. By underestimating access lines, rates are higher than required. For the subscriber who has underestimated, additional O&M funds will be needed or else requirements will have to be cut.

There are other problems associated with the budgeting process and rate stabilization program. Because of the dates established for various submissions in the overall federal government budget cycle, information used to initially develop rates for a given fiscal year is approximately fifteen months old by the time the actual rates are set. Subscribers must estimate average monthly access lines fifteen months or more prior to actual usage. In addition they are using planning rates developed from even more antiquated data to determine their budgeting priorities. Actual rates for the fiscal year are not established until well into the period of Congressional action on the budget for the upcoming fiscal year. Rates undergo revisions based on changes to budget requests by Congress. The end result is that the final rates actually used during the fiscal year are not known to customers, or the CSIF for that matter, until fairly close to the time they are implemented.

Stabilized rates also add a measure of inflexibility to the system. As has been stated, their purpose was to protect the customer from price fluctuations. However, insulation from price increases also prohibits gaining any advantage from possible price decreases. An example of this, though not connected with the CSIF, is the Military SeaLift Command (MSC) which is a component of the Navy Industrial Fund. During the oil crisis, the rates for the MSC were naturally inflated over previous years.

Afterwards, however, during a period of unstable and decreasing prices, the rates were not able to adjust to rapidly changing circumstances. This resulted in the MSC portion of the NIF showing an expanding profit for several years at the expense of its customers. The argument could be put forward that a similar situation might transpire with the CSIF in todays environment of changing regulations and the divestiture of AT&T.

C. ALLOCATIVE EFFICIENCY AND PRICING POLICIES

Besides questions concerning effective management of the DCS are those involving whether the current practices result in an efficient distribution of cost among users. Two of the areas that have been studied in this respect are military personnel costs at AUTOVON and AUTODIN switching facilities and DOD and non-DOD agencies which do not pay for services due to differences in the financing of leased and government-owned portions of the DCS. Both of these issues were mentioned in Section B while discussing management issues.

The responsibility for the various switching facilities associated with the DCS are delegated to the services. For example, the Navy operates three AUTODIN switching centers, five AUTOSEVOCOM switching centers and two AUTOVON switching centers. Though civilian costs are currently reimbursed to the services, no such credit is provided for costs incurred by the services for military personnel used at the centers. Table XIII shows a breakdown of funding changes that would result if a credit for military personnel costs were included in the CSIF. [Ref. 14: p.4]. Though it could be argued that similar situations exist throughout the DOD with joint programs, the issue is distribution of costs as an aid in increasing the efficiency of the system. By attributing

military personnel costs to the services vice the DCS, it is adding to the "hidden' costs of the DCS and penalizing some departments more than others. The questions remains as to the impact of this on efficiency. Further analysis will be provided in Chapter V.

Another area that has been questioned is the discrepancy between who pays for the O&M and procurement costs of the government-owned portions of the DCS and who uses these systems. 88% of the DCS is leased and therefore financed through the CSIF. The remaining 12% is government-owned and financed through the Military Departments and DCA appropriated funds. [Ref. 14: p.5]. The government-owned assets are broken down into three categories: Defense Satellite Communications System (DSCS), Transmission Media, and Common User Switching Systems. Tables XIV through XVI indicate the comparison between those who pay and those who use these services. The figures in the Tables are in millions of dollars. [Ref. 14: pp. 2-3]. It is obvious from these that the costs are not currently distributed with any regards to use, thus undermining one of the purposes of the CSIF of having customers pay for what they get, providing an incentive to hold down requirements to those actually needed. The good management practices and efficiency desired are degraded.

It has been alluded to throughout that a major problem confronting the DCA and its responsibilities to the DCS is that it lacks total control over the system. Areas of responsibility are delegated to others for both procurement and management when dealing with government-owned segments. A more serious problem exists when evaluating where DCA's authority begins and ends when dealing with the leased assets of the DCS. DCA's control extends only to the backbone portions of the DCS. Number and type of terminal equipment and access lines are the prerogative of the users.

This has the potential of having a tremendous impact on the effectiveness of the system in meeting its expressed goals.

Though a structure has been built to centralize leasing and payment, the centralization does not extend to management of the systems involved. There is no single focal point for evaluating, authorizing or requiring the optimum mix of access lines with particular baud rates for AUTODIN or the correct ratio of precedence or directionality for AUTOVON. This is left to the discretion of the individual departments based on their perception of their own needs and ability or desire to pay. It is natural that concern over one's own needs takes precedence over or overshadows those of the total structure. The result, however, is that there is no means of effectively controlling congestion, system architecture, system performance and numerous other variables.

One avenue that is available to DCA for control is its pricing policies. Though DCA has no inherent authority in access line decisions, its pricing policies for the backbone system are directly linked to these lines as outlined in Chapter III. The remainder of this chapter will be spent analysing how effective current pricing policies are in influencing user behavior and how efficient these policies are in allocating costs. Though rate development was described for both AUTOVON and AUTODIN, this discussion will be limited to AUTOVON. However, a similar case can be made for AUTODIN and the other systems.

The intent of the CSIF pricing policy is to allocate costs to subscribers based on their capabilities in using the system. In relation to AUTOVON this would imply charging based on the ability to increase congestion of the system. Weighted units are assigned in a manner which supposedly accomplishes this. By applying weighted units to precedence and directionality, the assumption is that these

are the factors influencing system costs and congestion. These characteristics, however, are not a true reflection of costs. For example, the monthly port fee charged by a common carrier for a line or trunk is the same whether it is two-way or one-way; and the cost of providing pre-emption capability is nearly the same regardless of the level of precedence provided. [Ref. 12: p. 9]. The question then is what effect does basing charges on these characteristics have?

An analysis of the effect of current weighted units based on precedence allows some insight into who is actually paying and for what they are paying. Table XVII indicates a breakdown of charge per weighted unit and average charge per line for various area capabilities based on projections for FY 1978. [Ref. 12: p. 11] By comparing the first and third columns it can be seen that the ratios between areas for charge per line and charge per weighted unit are not consistent throughout. For example, the charge per weighted unit of a line with global capacity is approximately five times that per weighted unit for CONUS only lines, whereas, the average charge per line in the same categories is fifteen times greater.

It is precedence that accounts for these differences. Statistics on precedence capabilities of oversea lines and area only lines prove the point.

	ROUTINE (%)	PRIORITY (%)
AREA	13	9
AREA-PLUS	97	79
GLOBAL	99	91

The columns are indicating the percentage of access having precedences greater than routine or priority with a given calling capability. [Ref. 12: p. 12]

The reasons for these differences are obvious to anyone who has ever tried to place an AUTOVON call overseas. Using routine or priority precedence is virtually worthless due to the volume of overseas traffic compared to trunk capacity. As a result, assigning weighted units to precedence is in fact assigning a charge to distance and becomes essentially a means of determining overseas access making the precedence charge a charge for overseas calls. By adding the values of average cost per line and average charge per line provided in Table XVIII, the analysis of the effect of precedence can be extended to include whether or not those who are creating the costs are actually paying for them. The table shows that this is not the case with area-plus and global customers paying a disproportionate share of the costs due to higher precedence lines, in essence subsidizing area only customers. [Ref. 12: p. 16]

One issue involving directionality needs to be discussed. It should be recalled from Chapter III that no weighted units are assigned to in-only lines based on the assumption that they serve in reducing system congestion since they only have the ability to remove calls from the system. The flaw in this assumption is easily apparent. If incoming calls are routed to the in-only line first, this frees lines with outgoing capability for more calls. It is probably a valid assumption that a new line was added to begin with because of excess demand. The addition of an in-only line results in increased congestion, the exact opposite of its purpose. Studies have shown that customers are well aware of this fact and use it to their advantage. Rather than adding additional in-only lines, they are used to replace existing one-way out or two-way lines thereby reducing costs without increasing capacity. [Ref. 12: p. 19]

It is not hard to conclude from this that those causing the congestion on the system or those with the greatest ability of placing a call are not necessarily the ones paying for this capability. In addition, there are problems concerning who is best able to take advantage of the situation. Large commands are understandably better able to adjust their mix of lines. If a small command functions with only one access line, it must be two-way. It is also true that the majority of in-only lines are in CONUS (4299), compared to Europe (105) and the Pacific (124). This adds to the distortion in cost allocation among the areas just discussed.

It appears that current pricing policies are defeating their purpose in a number of areas. Congestion is not being controlled, those paying the most for services are not the ones accumulating the most costs and are not the ones receiving the best services, and incentives are directed toward compounding the problem rather than alleviating it. The size of the overseas network is set by contingency requirements, so no attempt is made to relieve the congestion resulting from peacetime use. Therefore, users in these areas are forced to pay for higher priced precedence lines, as a result of weighted units, whose charges exceed actual costs. The size of the CONUS system is variable, with changes made as necessary to obtain a set grade of service. There are no restrictions, however, on how the system is altered and current practices favor an individual adding lines in a way proving detrimental to the system.

This chapter has identified a variety of criticisms directed at current CSIF practices. These range from the inflexibility of and lack of information available for constructive decision making to the ineffective incentive structure created by pricing policies. Problems due to budgeting procedures and the division of responsibilities

were also identified. Criticism serves no purpose unless made in conjunction with valid alternatives. The following chapter will attempt to provide this by looking at several proposals which have been made in an effort to correct existing deficiencies.

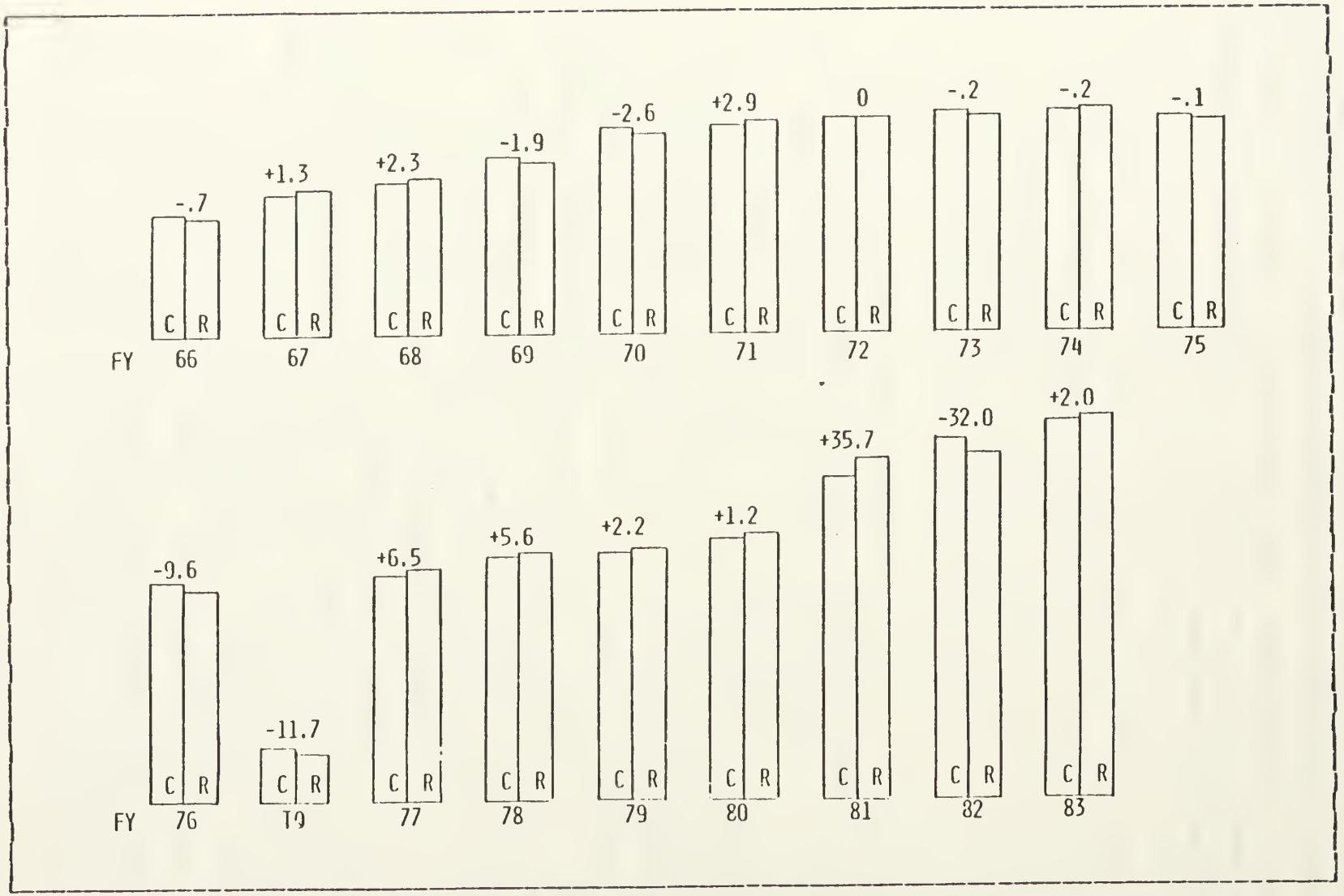

Figure 4.1 Summary Of Yearly Profits And Losses

TABLE XII

AUTODIN Budgeted And Actual Lines

FISCAL YEAR	BUDGETED	ACTUAL
1972	1204	1224
1973	1425	1430
1974	1340	1374
1975	1425	1297
1976	1389	1168
19TQ	1385	1180

TABLE XIII

Military Personnel Costs ($ In Millions)

	Current Funding	Alternative Funding
MilDepts	$5,512	$4,596
DCA	488	488
Other DOD	0	756
Non-DOD	0	160

TABLE XIV

Defense Satellite Communications System

	Cost ($)	Cost (%)	Usage (%)
MilDepts	2,391	96	65
DCA	115	4	3
Other DOD	0	0	27
Non-DOD	0	0	5

TABLE XV

Transmission Media

	Cost ($)	Cost (%)	Usage (%)
MilDepts	2,886	91	96
DCA	283	9	1
Other DOD	0	0	2
Non-DOD	0	0	1

TABLE XVI

Common User Switching Systems

	Cost ($)	Cost (%)	Usage (%)
MilDepts	235	72	93
DCA	90	28	1
Other DOD	0	0	5
Non-DOD	0	0	1

TABLE XVII

Charges Per Weighted Unit And Line

Type of Service	Charge Per Weighted Unit[a]	Average Weighted Units per Line[b]	Average Charge per Line[c]
Area			
CONUS	$ 253	1.13	$ 286
Europe	35	1.75	61
Pacific	340	1.85	629
Caribbean	4	--	--
Area Plus			
CONUS-Europe	591	3.30	1950
CONUS-Pacific	799	3.46	2765
CONUS-Caribbean	358	2.67	956
Global			
All	1242	3.58	4448

TABLE XVIII

Average Cost And Charge Per Line

Type of Service	Average Cost and Revenue Per Line (Dollars per Month)			Total Cost and Revenue (Thousands of Dollars per Month)	
	Average Cost	Average Charge[a]	Number of Lines	Cost	Revenue
AREA					
CONUS	$ 323	$ 286	14,013	$ 4,523	$ 4,008
Europe	85	61	819	70	50
Pacific	983	629	397	390	250
Caribbean	14	4	NA	--	--
AREA PLUS					
CONUS-Europe	1,456	1,950	237	345	462
CONUS-Pacific	2,031	2,765	353	717	976
CONUS-Caribbean	677	956	86	58	82
GLOBAL					
All	3,518	4,446	304	1,069	1,352
Totals (Monthly)				7,173	7,179
Totals (Yearly)				86,071	86,153

V. ALTERNATIVES

A. MANAGEMENT AND EFFICIENCY

Several of the problems discussed in Chapter IV have no viable solution. By this it is meant that the issue is larger than the CSIF. Various difficulties with the budget procedure and rate stabilization program were targeted throughout. Though options will be addressed for a number of the points raised, certain questions, such as the timing of the information required to prepare the budget, have no easy answers. Issues surrounding this aspect, involve the whole PPBS process within the DOD and can not be answered for the CSIF in isolation. Some of the problems discussed concerning the rate stabilization program must also be considered in the right perspective, specifically the questions on the inability of the present system to adjust rates down in favor of the customer if the situation so warrants. In this case it is felt that the benefits outweigh the costs, especially in today's fluctuating economy. In addition, given that the fund is obligated to adjust rates to erase any profits from previous years, any lost advantages are eventually regained.

Options have been studied for other issues raised in Chapter IV. Section B dealt with various management matters, primarily lease versus buy inflexibility, numerous cost allocation problems and troubles associated with budgeting for the CSIF. Section C was concerned with inefficiencies attributed to current allocation practices and the pricing policies linked with the subscriber rates presently used to distribute backbone costs. This section will deal with all of the issues addressed except for pricing

policies. The subsequent sections on usage-sensitive pricing will analyze the primary alternative under consideration in this area.

Conceptually, altering current discrepancies relating to military personnel costs and government-owned portions of the DCS would not be difficult. In Chapter III, it was pointed out that civilian agencies using the DCS are charged an additional 0.25% overhead charge to cover military personnel costs at DECCO headquarters. A similar arrangement could be initiated to offset both military personnel costs at switching facilities and the inequities currently existing between those who use and those who support the government-owned DCS segments. With the CSIF acting as a central collection agency, costs could be allocated and collected from all users on a pro rata share and then reimbursed to the appropriate services. Expected funding changes due to military personnel costs have already been mentioned in Chapter IV.

Though the effects of such a reallocation of costs would provide for a more equitable [2] distribution, it must be determined whether such a change is warranted by increased efficiency. It is arguable whether any significant management benefits would be realized from redistributing military personnel costs among all customers. Table XIX gives a more comprehensive breakdown of funding changes than that offered in Chapter IV. [Ref. 14: p. 8]. From the last column it can be seen that the major shifts occur within the three military departments, resulting in nothing more than a reshuffling of funds among the services. Other agencies experience only a minor change. It is doubtful that the Navy would embrace such a recommendation with enthusiasm

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[2]The concept of equity is being used here to imply that those who are contributing to costs are paying their share of those costs.

since its funding responsibilities would be increased by a larger amount than any of the others. In addition, the amounts involved are almost trivial compared to the overall size of the CSIF. It is doubtful whether such a reallocation of costs would influence customers in any meaningful way at all. There are no decisions made by users regarding the system that are connected with military personnel at switching facilities. There is no connection between these costs and a subscriber's decision to increase or decrease usage, or a determination as to the type or number of access lines needed. The administrative hassles associated with incorporating this revision into the CSIF are not compensated for by sufficient benefits to justify the change.

The same is not automatically true when looking at the suggestion for pro rating costs of government-owned system assets through the CSIF. Referring back to Tables XIV through XVI, by consolidating the values it is seen that the Military Departments and DCA pay 100% of the costs for all of these resources while using only 86%. The remaining 14% is used by other Defense agencies and non-DOD organizations who pay nothing. The dollar amounts involved are not insignificant and the potential effects on the system are detrimental. By charging those customers who presently enjoy a "free ride", incentives for reducing, or at least reevaluating, requirements are incorporated into their planning processes. If this would lead to reduced requirements, it might eliminate the need to expand the existing system, lowering future costs for all. More accurate information for lease versus buy studies and supporting economic analyses would also be available.

One conceivable problem area could be linked with this recommendation. If those agencies currently being provided services at no cost are confronted with the necessity of paying for these services they might not seem as attractive

as before. The prospect exists that they could go elsewhere. The end result would be that those now paying all costs would continue to do so but total costs to the government would increase due to the expense of the alternative system. The possibility of finding a more desirable alternative is limited, since it is only 14% of the cost that are under consideration, but it should be a consideration in planning strategies.

These modifications do not address what are potentially more serious issues for the DCS. Other areas critiqued in Chapter IV, such as its inflexibility and the breakdown in control over capital equipment due to a segregation of fiscal responsibility in obtaining funds and justification of those funds, are central to DCA's ability to structure the DCS as needed. Though several alternatives have been put forward, the one that has gained the most acceptance would involve using CSIF appropriations to finance all future DCS procurements. Procurement costs would be amortized over the useful life of the equipment and both capital and O&M costs would be recouped from DCS customers through predetermined subscriber rates similar to the present AUTOVON and AUTODIN rate procedures. Money collected could then be used to finance additional purchases. [Ref. 7: p.25]

This recommendation is actually an alternative to that just discussed where capital equipment would still be purchased through military procurement funds but a charge would be levied on other users. Purchasing equipment through the CSIF extends this concept with additional benefits. The central element of the prior suggestion still remains. All users would have a charge levied against them as opposed to the present situation. Therefore the same benefits in terms of altering the incentive structure and lease versus buy decisions are realized.

Using the CSIF to finance capital equipment offers the following advantages as well. [Ref. 7: pp. 26-28]

(1) System priorities and program balance would more easily be established and maintained as compared to the present system whereby each DOD component financing DCS requirements prepares and defends his portion of DCS resources in the program and budget process with varying degrees of success. CSIF financing of the DCS would place DCA in the position of justifying the overall system resource requirement and DOD components justifying the cost of DCS service they use through predetermined rates.

(2) Interservice Support Agreements (ISA) presently used for the AUTOVON and AUTODIN program provide an effective means for managing DCS resources. ISAs serve as a contractual arrangement between DCA, as manager of the DCS, and military department components who operate and maintain the system. This provides a sound basis for viewing requirements on a system basis throughout the PPBS process, and monitoring the use of resources through budget execution. This procedure also provides resources visibility necessary, where appropriate, to establish uniform cost and manpower factors. Extending ISAs to cover all DCS operating costs would provide the same benefits. The CSIF method of financing also provides an effective means of evaluating overhead costs for the work being accomplished through improved visibility.

(3) Flexibility to exercise lease versus buy options would be significantly enhanced by financing DCS capital equipment and O&M requirements through the CSIF. CSIF financing would allow the most cost-effective lease or

buy options to be exercies in a timely manner at any time.

(4) Central accounting for DCS capital and operating expenses using uniform data elements and procedures would significantly improve DCA's ability to monitor the actual application of these resources in relationship to planned objectives on a system basis. The data base would also serve as a valuable management tool in developing cost factors and models, trend analyses, and similar management study analyses.

(5) CSIF financing of DCS capital equipment and operating resources should achieve DCS cost savings. Bulk procurement, uniform cost and manpower standards, and improved resources visiblity on a system basis are all management improvements which should provide more efficient DCS financing.

There are several disadvantages associated with this method, all of which have been alluded to in connection with other alternatives discussed. Financing DCS capital equipment and additional O&M requirements through CSIF under present rate structure methods, would result in a significant increase in customer rates for DCS services and, without adequate controls, might cause customers to obtain services from other sources, increasing overall costs to the government. In addition, CSIF financing DCS capital equipment would transfer these costs from the military department procurement appropriations to CSIF customer O&M accounts. Considerable pressure in the past has been applied to reduce the Defense budget O&M costs. The initial increase to the O&M budget, even though offset in the procurement appropriation, might further complicate justification of telecommunications O&M requirements. These concerns do not seem to

outweigh the improvements attributed to centralizing all financing under the CSIF. The benefits derived in the area of management efficiency and cost accountability indicate that this is a recommendation worthy of consideration. [Ref. 7: p. 29]

There is one final point to be looked at before attention is directed at pricing policies. In Section B of Chapter IV the problems connected with overestimation of demand were discussed. A proposal for correction has been put forward involving several steps. First, agencies would be billed at the end of the year for actual lines and for actual costs rather than through preestablished rates as now done. Secondly, O&M funds would be restricted for use to DCS payments rather than being available for alternative activities. Any O&M surplus would be applied against the coming year's budget. Any shortfall would be made up by newly budgeted funds. This procedure would not eliminate the need for estimations. Projections would still be required for planning and budgeting purposes. The difference is that these estimates would no longer be the basis for billing through subscriber rates. The incentive to overestimate is removed along with its effect on the total pricing structure. [Ref. 13: pp. 65-66]

On the surface this appears to be a viable alternative. However, further analysis reveals the complexities involved. Restricting O&M funds to a specific purpose presents a major problem in the form of oversight. Who is going to be responsible for ensuring that the money is indeed used strictly for its designated purpose? What kind of additional accounting will be necessary to determine the amount available for carry over to the next year's account? Must AUTOVON funds be separate from AUTODIN funds? If a customer ends the year with a deficit in O&M funding what additional problems will there be in justifying the money to make up

the shortfall plus getting an adequate level of funding for the upcoming year? If a subscriber does have a surplus one year, and therfore requires a lower level of funding the following year, how hard will it be to justify funding back to the original level in subsequent years? Might this method not increase the amount of reprogramming required to make up shortfalls throughout the year? The recommendation appears to override the whole purpose of the rate stabilization program. Though planning is done through the use of estimates, actual payments are based on real costs. The customer is returned to the position of being subject to fluctuations. It is probably close to impossible to accurately determine demand approximately fifteen months prior to use. It would seem likely therefore that there will always be a surplus or deficit for every customer. The problem does not seem to be solved by this, it has simply been moved back one level from the CSIF to the customer.

B. USAGE SENSITIVE PRICING - A DEFINITION

Section C of Chapter IV dealt with the inefficiencies built into the current pricing policies of the CSIF. DCA is concerned with three area of the DCS: capacity, congestion and an optimum mix of lines. Considering the balance of management authority when working with the DCS, the pricing policies instituted through the CSIF are potentially an effective means of accomplishing desired results. The present method of allocating costs does not succeed because the incentives created are counter to those needed to influence behavior in the manner wanted by DCA. As described in Chapter IV, precedence charges, which are significant due to the weighted units assigned to this capability, are more of a charge for distance than the ability to "capture" system capacity over others. It has become a charge for overseas

service, since it is a necessity in order to complete such calls. Weighted units specified for directionality encourage a mix of lines leading to increased congestion with no comparable increase in capacity. In addition, there is nothing built into the present system to induce users to consider the number of calls made. An alternative pricing system receiving extensive attention in both the civilian and military sectors is usage-sensitive pricing (USP). The key basis of cost allocation is exactly what the name implies - use. Rather than distributing costs by assigning artificially defined weighted units to access lines, customers are charged for actual use.

Economists have looked at many situations similar to the DCS. Circumstances exist where there is a facility of fixed capacity, as with AUTOVON or AUTODIN. The capacity must be allocated among potential users. In addition, rules must be developed to determine when and under what circumstances that capacity should be enlarged. The solution to the problem involves devising a set of charges that will lead to the facility being utilized so as to maximize its productivity, and thus minimize the costs of providing services. [Ref. 12: p. 26]

The existence of AUTOVON is justified by the fact that communication needs in the event of a national emergency require a dedicated telephone network. In the absence of an emergency these facilities have unused and economically useful capacity. The question is then: How can this capacity be best allocated among alternative users? In addition, given that the emergency capacity is inadequate for peacetime demands, how should it be expanded upon or integrated with other facilities in order to maximize the economic value of the whole? [Ref. 12: p. 26]

The general set of economic principles which guide efficient allocation is marginal cost pricing. A strict

application of marginal cost pricing would require that the price of each service provided by the system be equal to the actual cost of the resources used in producing the last unit of that service. A corollary proposition is that, if prices are different from marginal costs, inefficiency will result. [Ref. 12: p. 27]

If, as is the case with AUTOVON, there are some fixed costs of operation and a requirement that all costs be covered by revenues generated, the marginal cost principle enunciated above must be modified. The cost per unit of service should still be the marginal cost, but the fixed costs should be recovered by an entry fee that is independent of use. Thus the pricing system would have two components: a fixed charge for the right to use the system and a charge that varies with usage and with the indices of usage which are related to costs (e.g., number and duration of calls, distance called, time of day). Generally, the application of marginal cost pricing principles is referred to as usage-sensitive pricing. [Ref. 12: p. 27]

C. USAGE-SENSITIVE PRICING IN THE CIVILIAN SECTOR

The United States and Canada are among the few major countries that use flat-rate pricing for local service. There are some 170 million telephones outside the United States; approximately 91% of these are measured. Local call timing is practiced in England, Spain, and Japan. Most of the rest of Continental Europe charges on a basis of one message unit per call. The concept of USP is not new to the United States. After World War I, message registers, which recorded the number of calls, were provided in central offices. Subscriber billing was calculated on a per call basis. In the 20's, instruments were in service in Everett, Washington, which measured not only the number of calls, but

also the holding time of the call. Such instruments record the time within 15 seconds. A special clock was used which allowed the lengthening of the increments to 2 minutes in order that a peak-type pricing scheme could be used. As early as 1908, the Rochester Telephone Company was interested in recording telephone service on an elapsed time basis. One can go back even further and find that the work on developing metering devices was done in the 1880's; however, because of competition between the growing Bell system and independent companies during this period, the offering of a metering service was avoided. [Ref. 15: pp. 6-7]

There has been a new surge in interest over the last decade due to inflation, increased local usage, and competition from independent firms that sell telephone equipment and supply private toll lines to business customers. Since World War II, technological advances have benefited long distance far more than local telephone calling. Developments in microwave communications, coaxial cable, satellites, and waveguides have dramatically lowered the costs of long distance transmission. In contrast, the costs of local service have moved upward since the late 1960s. Faced with a continuing stream of requests for local telephone rate increases, state regulatory commissions are finding the concept of tying prices to usage increasingly attractive. [Ref. 16: p. 1]

Emerging competition in the telephone industry has brought into question all aspects of the established carriers' pricing policies. Historically, regulatory bodies have allowed long distance rates to exceed costs; the resulting surplus has been used to subsidize local exchange rates through the accounting procedures for "separating" toll revenues between state and interstate calling. Now, under the Federal Communications Commission's (FCC) policy of

encouraging competition, the growth of specialized common carriers who supply long distance services to large customers is generating pressures to establish cost based rates. In opening its inquiry into the effects of competition, the FCC noted [Ref. 16: p. 2] :

> "...the public interest might better be served by converting from flat rate, cost insensitive exchange service pricing to measure rate or cost-related pricing in order to prevent any unwarranted losses in intrastate revenue requirements from (competition)."

It has been an AT&T policy since the mid-70's to phase out flat-rate telephone service. During that time period AT&T Chairman, John deButts, was quoted as saying [Ref. 15: p. 5] :

> "We are moving more and more into the direction of usage-sentive pricing, meaning the more a customer uses his phone, the more he pays. AT&T hopes to phase out completely flat-rate telephone service and begin making individual charges for calls from all home phones."

In more and more states, measured service is becoming mandatory for business subscribers and available at least optionally to residential subscribers. California now requires USP for businesses in large cities. The state also has adopted a special "lifeline" service for residential subscribers. The service offers a lower monthly rental than flat-rate service, a number of free local calls each month, and a charge for each additional local call. In Illinois, General Telephone has begun field trials of measured residential service in several local exchanges, and regulatory commissions have approved mandatory use of measured service in Chicago and New York. [Ref. 16: pp. 2-3]

Discussion of civilian practices are not necessarily relevant to the unique aspects of the military environment, however data that has been developed through mathematical

modeling may prove helpful in showing what results might be expected if DCA were to go to a similar system. Without going into the actual methodology used, Table XX illustrates what the effect on number of calls and cost would be when changing from a flat rate to a measured pricing policy. "L" is the monthly fee charged for access and "p" is the charge per call. Several points can be made. It is seen that as a shift is made from flat-rate to USP, the number of subscribers increase. This would not be a factor for the DCS since all agencies requiring access to a given system are already subscribers regardless of cost. The significant elements have to do with number of calls and cost, both of which decrease. Note that the lowest values for each of these factors occurs when the monthly access fee is the lowest and price per call is the highest. Though there are many distinctions between the civilian and military systems, this data at least provides some insight into what the potential ramifications of moving to USP might be. [Ref. 16: p. 31]

D. USAGE-SENSITIVE PRICING IN THE MILITARY

In order to institute USP practices in the DCS, each system would have to be looked at separately in order to determine the major components of costs and how these costs should be allocated. For AUTOVON there are three primary cost generating factors: access, usage and precedence. Usage refers to distance and length of a given call. [Ref. 12: p. 42] Much time has been spent in determining how best to implement this new policy. The methodology is too extensive to describe here and no data is currently available to indicate how effective it will be. Beginning in FY86 a two year study will start for the purpose of collecting such data. The European Telephone System will be used to determine its significance to voice systems. DDN will be used for message systems.

Usage-sensitive pricing has four basic objectives [Ref. 12: p. 67] :

(1) To induce subscribers to choose the number of access lines and precedence that best suits their traffic requirements.

(2) To provide incentives for efficient use of the system.

(3) To allocate the costs of the system to the agencies that use it; the billing should also provide information that will permit agencies, if they wish, to shift the costs to or impose controls or regulations on the individuals or agency subdivisions doing the calling.

(4) To provide reliable information to the supplier of the service upon which to base decisions about how much capacity is required.

The following observations indicate how usage-sensitive pricing can be expected to aid in the achievement of these four objectives. They have been taken from reference 12, pages 68 through 70.

(a) If the monthly backbone charge is very low and nearly all reveneues are collected through usage charges, the number and mix of access lines will be more nearly optimal than if connectivity fees are high. At present, users must pay the same amount whether they use a line heavily or very little. Deciding to add one more line requires budgeting a significant amount of money. As a result, they are more likely to accept a higher level of congestion before acquiring a new access line than they would if access costs were near zero and revenues were collected for usage. In addition, if usage charges were instituted, the rationale for differential charges for two-way and one-way lines

would disappear. Selection of the proper mix of lines then would be based upon the technical requirements of the user rather than artificial price differences. The resource cost of adding a line would be paid through access fees. The cost of using it would be paid through usage charges.

(b) Charging for usage on the basis of distance, holding time and precedence would allocate costs efficiently to each user agency. Adjustments to the present charging system would make it possible to allocate the total costs of a particular category of service, e.g., CONUS, to the entire group of subscribers using that service. Subscribers would still not be paying their share, however. Only usage charges will permit allocation of costs properly to individual agencies or individual lines. Usage charges would also permit agencies to impose valid controls or restraints on callers. With the current charging system there is little justification or incentive to do so.

(c) Charging for usage would provide incentives for callers to make fewer and shorter calls, thus reducing congestion costs and possibly reducing backbone costs. The degree to which such a result might be expected depends, of course, upon the policies user agencies follow in response to the bills it would receive from DCA.

(d) If user charges are zero and all revenues are collected through connectivity fees, the service supplier has imperfect information upon which to base decisions on the amount of capacity to provide. If there is congestion, it derives from calls that would not be attempted if they were properly charged for.

If there is no congestion with zero user fees, there is almost surely excess capacity. Thus, the level of congestion is not a valid standard against which to measure the adequacy of capacity. This point has little relevance for the overseas network where capacity is fixed and independent of congestion. In CONUS, however, capacity is adjusted on the basis of a target level of congestion. But this target level is arbitrary and has no relation to an optimum grade of service. If user charges were instituted, the grade of service would be a more meaningful indicator of congestion costs.

(e) When user charges are zero, total costs, including congestions costs, will exceed the total costs incurred when appropriate usage charges are instituted. The real cost of supplying a given quantity of service is virtually fixed, but as the price per call charged the user falls below the marginal cost, more low valued calls will be attempted and the congestion costs imposed upon all callers, particularly those with high valued calls, will increase.

(f) The existence of precedence capability reduces the cost of congestion by assuring that high valued calls are successfully placed. It introduces another cost, however, that is imposed upon those whose conversations are interrupted. The introduction of usage charges for precedence calls would allow the direct costs of precedence calls and the indirect cost of interruptions to be allocated to callers not just on the basis of capability but also as a function of how many high precedence calls they make. Charging for precedence calls would provide an incentive to select lower precedence for calls of lower value.

(g) Charging for usage would permit the costs of overseas calls to be allocated to overseas users, regardless of precedence. With the current price structure, most of the cost of providing overseas service is collected through precedence charges. Usage charges based on time and distance would not only allocate costs correctly to individual users, but would lead to better allocations of overseas trunk capacity. It would also provide a basis for judging whether that capacity is adequate.

(h) In imposing usage charges, DCA could (a) improve the efficiency of cost allocation, (b) influence agencies in their choice of numbers and kinds of access lines, (c) affect only indirectly the behavior of callers. DCA's responsibility is limited to the backbone portion of AUTOVON. It has virtually no control over any activities outside the backbone. Thus, its pricing policies directly affect only the decisions made at the agency level. Effects upon caller behavior would depend upon agency response to the prices they face. The agencies could use discipline or budgetory procedurs to influence callers if they wished to do so.

(i) Preliminary estimates of the per minute charges that would cover the cost of calls within CONUS indicate that the user fees required would be considerably below those for the Federal Telecommunications System (FTS) and commercial services. For example, the estimated charge per minute for a call of greater than 1,000 miles is 11.1 cents; that recommended for FTS in a recent study done for GSA was 23.9 cents.

E. PROBLEMS WITH IMPLEMENTATION

If USP is able to accomplish all it is hoped it will, the difficulties in changing over will be well worth the effort. There are definitely problems associated with such a change. One major area of concern is costs. If in executing USP total costs of operations increase, any benefits derived are incidental. DCA cannot order departments and agencies to accept the change to USP. In order for it to be effective, all concerned must be convinced of its advantages. If the result of charging for use is an increase in payments to the CSIF, it would be hard to justify to customers and Congress that any benefits were worth it. Cost increases would be due primarily to the extra equipment required for measuring usage. How this additional equipment will effect total costs, in concert with any cost reduction as a result of a decline in usage, is one form of information the two year study will hopefully provide.

Another area that should be of some concern is what impact this will have on the planning and budgeting process. Several points have been discussed regarding the difficulties involved in forecasting access line usage. Imagine trying to estimate the number of calls in the case of AUTOVON, or the number of messages for AUTODIN. In fact one suggestion has been to charge based on lines of message so that costs are more accurately distributed to those who write lengthy messages. Over time a pattern would undoubtedly emerge to aid in these estimates but in the intervening years, the disruption to O&M funding would be tremendous.

Following on from the preceding discussion is how effective USP can actually be in meeting the objectives listed in Section D. In order for such a pricing policy to motivate users in the manner desired, the users must be directly

effected by any changes. The underlying assumption of USP is that when confronted by a charge for every call or every message, the users will alter their behavior to reflect this. The problem arises due to how the DCS is actually funded within the various services and agencies. Throughout this thesis when referring to the user or the customer, this has not been a reference to every single entity connected to the system down to the lowest level. Planning and budgeting are centrally done at COMNAVTELCOM for the Navy. All O&M funds for the DCS are also maintained at this level. What this means is that in charging based on usage as opposed to access line connections, the only level within the service that will actually feel the effect directly is COMNAVTELCOM. Unless new policies and enforcement procedures are implemented by those in charge, the individual command will perceive no difference between the current and proposed method of pricing. The incentive structure of USP alone does not extend that far. Major departments may not view the increased administrative difficulties in a favorable light, but without them the effectiveness of USP is lost. The two year study will allow activities the time to determine how stringent enforcement must be and the best way to implement any new procedures.

TABLE XIX

Funding Changes For Military Personnel

CSIF AUTOVON and AUTODIN Funding

	Current CSIF Cost	Change to include MilPers	Revised CSIF Cost	Credit for MilPers	Cost to Users	Change in Funding
AUTODIN						
Army	16.8	+ 5.2	22.0	- 6.3	15.7	- 1.1
Navy	11.8	+ 3.5	15.3	- 1.2	14.1	+ 2.3
Air Force	22.0	+ 7.0	29.0	-10.1	18.9	- 3.1
Defense Agencies	5.0	+ 1.6	6.6		6.6	+ 1.6
Non-DoD	.7	+ .3	1.0		1.0	+ .3
Total	56.3	+17.6	73.9	-17.6	56.3	-0-
AUTOVON						
Army	52.2	+ 1.5	53.7	- 1.3	52.4	+ .2
Navy	32.3	+ .9	33.2		33.2	+ .9
Air Force	103.9	+ 3.0	106.9	- 4.4	102.5	- 1.4
Defense Agencies	7.6	+ .3	7.9		7.9	+ .3
Non-DoD	1.3		1.3		1.3	
Total	197.3	+ 5.7	203.0	- 5.7	197.3	-0-

TABLE XX

Data On Usage-Sensitive Pricing

CHANGES IN NUMBER OF SUBSCRIBERS, CALLING RATES, AND MONTHLY BILLS UNDER TWO-PART TARIFFS

Item	Flat Rate (L = $5.50, p = 0¢)	Measured Rate: Alternative I (L = $3.00, p = 2¢)	Measured Rate: Alternative II (L = $2.00 p = 3¢)
Average-Income Households (λ = 1.0)			
Number of subscribers[a]	88.1%	98.0%	99.7%
Calls per subscriber per month	120	101	94
For original subscribers:			
Calls per subscriber per month	120	108	102
Monthly bill	$5.50	$5.16	$5.06
For new subscribers:			
Calls per subscriber per month	--	38	33
Monthly bill	--	$3.76	$2.99
Low-Income Households (λ = 0.8)			
Number of subscribers[a]	77.0%	93.1%	98.2%
Calls per subscriber per month	129	102	91
For original subscribers:			
Calls per subscriber per month	129	113	105
Monthly bill	$5.50	$5.26	$5.15
For new subscribers:			
Calls per subscriber per month	--	47	40
Monthly bill	--	$3.94	$3.20
High-Income Households (λ = 1.4)			
Number of subscribers[a]	97.0%	99.8%	100.0%
Calls per subscriber per month	113	103	99
For original subscribers:			
Calls per subscriber per month	113	105	101
Monthly bill	$5.50	$5.10	$5.03
For new subscribers:			
Calls per subscriber per month	--	36	28
Monthly bill	--	$3.72	$2.84

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The main thrust of this thesis has been to analyze the effect that the current policies of the CSIF have had on the ability of the DCA to influence the design of the DCS. The major area of interest has been the discrepancies between what the DCA is attempting to accomplish and the behavior elicited from the incentives created by present fund mechanisms. Management difficulties extending from the complex array of players invclved in decision making have been examined along with issues relating to budgeting and planning procedures, and the availability of accurate information for determining the most beneficial course of action. A summary of the principal conclusions reached is provided below.

1. Management Issues

There are two primary facets of current fund practices which preclude effective management: current methods of financing capital and government-owned equipment and the division of responsibility and authority. The division of responsibility and authority prevents the consolidation of requirements in the broad context of the system as a whole. DCA has no authority beyond the backbone portions of the networks, with decisions as to access lines and terminal equipment remaining the province of the users. Fund activity is dependent on budgeted O&M appropriations from each user which requires DCA to accomplish its planning and programming with no identifiable fiscal target, dealing with fragmented cost data across departmental lines. Individual departments naturally view their needs above those of the

aggregate which disrupts planning, budgeting and justification of the total structure.

The present method of financing capital and government-owned assets by purchasing them through designated services' procurement appropriations results in several deficiencies. Lease versus buy flexibility is restricted virtually locking in the decision once it is made. Since these costs are not distributed to all users of the service, the true cost of providing such services is hidden. This interferes with accurate analyses for lease versus buy decisions and consideration of alternative services, plus places the burden of budgeting for and justification of such services on only a few of the users.

A consolidated communications system cannot operate effectively when the major functions of planning, budgeting and program justification are decentralized. A mechanism for more extensive coordination and a single focal point for system justification is required.

2. Allocative Efficiency

The current incentive structure, created by charging for the backbone network based on weighted units assigned to access line characteristics, has not been successful in influencing optimum capacity or mix of lines or in controlling congestion. Characteristics chosen are not necessarily indicative of the cost creating features of the system and the assumptions underlying weighted unit assignment are not always valid.

Though the concept of industrial funding has as its central feature that "buyers' pay for what they use, thereby causing them to consider their needs against costs, present CSIF policies undermine this objective. By paying for backbone costs based on access lines, actual use of the system is still perceived as being free. There is nothing to

encourage a user to consider the value of an individual call or message placed into the system. This is intensified by the fact that all O&M money appropriated for DCS payments is kept at the COMNAVTELCOM level, insulating all lower level users from any incentive structure created by CSIF pricing policies--present or future.

B. RECOMMENDATIONS

Several alternatives to current CSIF practices were described and analyzed in Chapters IV and V. The value of each has been discussed and will not be repeated here. Any changes considered must address both the management concerns and incentive inadequacies. A solution to one does not automatically include the other. From those alternatives previously enumerated, the following recommendations are offered for consideration.

(1) Total authority and responsibility for the DCS should be consolidated under DCA. This includes financing of all capital equipment and final decisions on number and type of access lines added and terminal equipment attached.

(2) The first recommendation by itself will not have an effect on congestion and therefore required capacity. Some form of usage-sensitive pricing should be incorporated into pricing policies.

(3) Operation and Maintenance funds designated for DCS telecommunications services should be distributed by COMNAVTELCOM to the subordinate levels.

By requiring final approval on system attachments by DCA, a coordination mechanism is added to the system which was previously lacking. When dealing with a system which is

of the magnitude of the DCS, a single point of authority is needed which can view the development outside the realm of partisanship. Financing capital and government-owned equipment through the CSIF allows for distribution of costs through the regular reimbursement cycle. Inflexibilities of the system are reduced and DCA becomes the single organization responsible for justifying system changes. By financing all assets through the CSIF, such justification is made easier with more accurate cost data and economic analyses.

Civilian studies have indicated that usage-sensitive pricing has the potential for modifying user behavior in a manner beneficial to the system. Charging for use forces consumers to evaluate their actions each time the system is used. Studies propose that the result will be a reduction in total usage which will effect congestion and subsequently required system capacity. Charging based on use will at least offer a more realistic estimate of what the optimum capacity of the system is.

Since O&M funds are currently maintained by COMNAVTELCOM, moving to usage-sensitive pricing will have limited influence on lower level subscribers unless changes are initiated in internal procedures. Numerous revisions to the present method could be outlined, however, the most effective as far as bringing the incentives closer to all users would be to filter O&M funds down to the lowest level. This will not , of course, solve the problem of what to do about the individual user. The primary area of concern in upcoming years, will probably center on this aspect of monitoring and controlling usage.

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